Environmental Protection Agency

Horiba Emission Analysis System Sample Collection and Exhaust Measurement Procedure

This procedure is written for the Environmental Protection Agency, National Vehicle and Fuel Emissions Laboratory (NVFEL) internal use. The use of specific brand names by NVFEL in this procedure are for reference only and are not an endorsement of those products. This document may be used for guidance by other laboratories.

NVFEL Reference Number

730E

Implementation Approval

Original Procedure Authorized by EPCN #242 on 08-10-99

Revision Description

(1) 08-23-99   The purpose of this change is to revise the procedure as described in EPCN #243.

(2) 02-23-00   The purpose of this change is to revise the procedure as described in EPCN #276.

(3) 05-10-00   The purpose of this change is to revise the procedure as described in EPCN #288.

(4) 10-10-00   The purpose of this change is to revise the procedure as described in EPCN #293.

(5) 01-10-01   The purpose of this change is to revise the procedure as described in EPCN #294.

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Attachments

1. **Purpose**

   The purpose of this procedure is to collect samples of the gaseous emissions in the exhaust of gasoline-fueled vehicles during the Federal Test Procedure (FTP) or the Highway Fuel Economy Test (HFET) using the Horiba Automatic Emission Analysis System.

   TP 707, Sample Collection of the Urban Dyno Exhaust Emission Test and TP 708, Exhaust Sample Analysis are official procedures for sites not using the Horiba Emission Analysis System.

   Unless otherwise specified, the driver is responsible for completing the steps in this procedure.

2. **Test Article Description**

   Light-duty vehicles scheduled for Certification, Fuel Economy, Enforcement, or other testing.

3. **References**

   3.1   "Code of Federal Regulations," Title 40, Part 86, Subpart A, Section 86.082, and Subpart B, Sections 86.105, 86.106, 86.107, 86.108, 86.109, 86.111, 86.113, 86.114, 86.115, 86.116, 86.121, 86.122, 86.123, 86.124, 86.125, 86.126, 86.127, 86.128, 86.129, 86.130, 86.135, 86.136, 86.137, 86.140, 86.142, 86.144 and Appendix I

           Part 600 Subpart B, Sections 600.106, 600.109, 600.110, 600.111, and Appendix I

   3.2   Environmental Protection Agency (EPA) Test Procedure, TP 703

           All references include procedures referenced and all subsequent revisions thereof.

   3.3   "Macintosh Plus Manual" #M1503

   3.4   MacAcademy training video cassette, "Basic Macintosh"

   3.5   See TP 703 for the 48" single-roll electric dynamometer power start-up and power shutdown procedures.

   3.6   "ASTM Rounding Off Procedure," July 15, 1990

   3.7   EPA current safety policies

   3.8   Horiba Constant Volume Sampler Operation Manual

   3.9   Horiba Chassis Dynamometer Test Control System (CDTCS) Manual

3.10   Horiba MEXA 7000 Series Training Manual

3.11   Horiba Series 7000 User Guide

3.11   NEFF Instrument Corporation System 470 Operation and Maintenance Manual

3.12   TP 205, Span Point Change Notice

4.   Required Equipment

4.1   Form 730-01, "CDTCS Sample Collection and Exhaust Measurement"
        (Attachment A)

4.2   Form 708-01, "Vehicle Test Data Sheet" (see TP 708)

4.3   Form 902-01, "Test Status Report"

4.4   Vehicle Specifications Report (VSR)

4.5   Video Driver's Aid (VDA) System:

      4.5.1   Data Acquisition Microcomputer

      4.5.2   Video Monitor

      4.5.3   Data Acquisition Device

      4.5.4   Laboratory Network System (LNS)

      4.5.5   Network Printers

4.6   Chassis dynamometer (dyno):

      4.6.1   Twin-roll hydrokinetic dynamometer

            Equipment used: Clayton ECE-50 with a power absorption unit to simulate
                                the road load power and flywheels to simulate the
                                vehicle's equivalent test weight

4.6.2   48" single-roll electric dynamometer and data acquisition equipment

Equipment used: Horiba LDV-48-86-125HP-AC Single Roll 48-Inch
Electric Dynamometer with:

CDC-900 Computerized Dynamometer Controller

RTM-200 Real-Time Monitor Computer

CTM250G Microterminal

Power Converter, Power Exchange Unit (PEU), torque
measuring system, and speed measuring system

4.7   Dynamometer roll revolution counter (used with twin-roll hydrokinetic
dynamometer)

Equipment used: KLT-Custom fabricated to EOD specifications

4.8   Vehicle restraint system for:

4.8.1   Twin-roll hydrokinetic dynamometer, rear drive type:

Cable winch, permanently affixed to the test cell floor, to restrain the test
vehicle horizontally on the dynamometer to minimize vehicle rocking

Equipment used: Little Mule Products Model #B2 Puller Hoist

4.8.2   Twin-roll hydrokinetic dynamometer, front drive type:

Cable winches, permanently affixed to the test cell floor, or anchor hooks
attached to the dynamometer frame, and tie-down straps to restrain
front-wheel drive vehicles on the dynamometer

Equipment used: Little Mule Products Model #B2 Puller Hoist
or Eastern Rotorcraft Corp. Tie-Down Part #SP-4212-1

4.8.3   Twin-roll hydrokinetic dynamometer, wheel chocks

Equipment used: Clayton
or airplane-style chock blocks

4.8.4   48" single-roll electric dynamometer, wheel chock assembly

Equipment used: Single-roll dynamometer wheel chock assembly,
fabricated per EOD requirements

    4.9   Exhaust Connectors:

           4.9.1   Flexible exhaust tubes

           4.9.2   Exhaust tube adapters

           4.9.3   Clamps

           4.9.4   Gaskets and boot assembly

                Equipment used: All the above are fabricated to meet requirements;
                                      see blueprint file drawings TO4 88B-(0-11).

    4.10   Horiba MEXA 7200 Exhaust Gas Analyzers

    4.11   Horiba Constant Volume Sampler

    4.12   Compressed air supply with air hose, tire inflation chuck, and calibrated pressure gauge

    4.13   Fixed speed cooling fan with a capacity not exceeding 5,300 cubic feet per minute (cfm). Additional or special cooling fans may be used if approved in advance by Certification Division or the appropriate Task Officer.

           Equipment used: Hartzell Fan Model #N24-DUWS

    4.14   Test Cell Ambient monitoring system:

           4.14.1   Type "J" thermocouple and temperature/millivolt transmitter, or thermocouple thermometer connected to a strip chart recorder

           4.14.2   Dew-Point Hygrometer located in the test cell.

5.   Precautions

    5.1   For the FTP, the vehicle's ignition key must remain in the "Off" position until the start of the test. Turning the ignition to "On" can affect the engine fuel system.

    5.2   For the FTP, the vehicle's windows must remain down during the 12- to 36-hour soak period on those vehicles equipped with power windows, since turning the key to the "On" position before the test may affect the fuel system.

    5.3   The dynamometer must be warmed up before use.

5.4   The driver must not use the test vehicle brakes and accelerator simultaneously; therefore, brakes and accelerator must be operated sequentially using the same foot.

5.5   The restraint system that secures the test vehicle on the twin-roll hydrokinetic dynamometer must have the slack removed so approximately 2 inches of play is at the center of the cable or strap for a front-drive system, 4 inches for a rear-drive system.

5.6   The restraint system that secures the test vehicle on the 48" single-roll electric dynamometer must be adjusted to position the vehicle's drive wheels approximately at the roll surface crown.

5.7   When the test vehicle is connected to the CVS, care must be taken to avoid putting excessive strain on the vehicle's exhaust system. The CVS blower must be operating when the vehicle's engine is running.

5.8   The exhaust scrubber system (accessed through the test cell floor) must be on and operating properly.

5.9   The vehicle starting procedures must be with the vehicle.

5.10   The test cell door(s) must be closed before starting the vehicle engine and while it is operated on a dynamometer.

5.11   The driver must remain inside the vehicle in the proper driving position at all times while it is being operated on the dynamometer.

5.12   The test vehicle must be correctly aligned on the dynamometer prior to testing.

5.13   The 48" single-roll electric dynamometer contact must be engaged and the "RUN MODE" must be selected before driving the test vehicle.

5.14   The 48" single-roll electric dynamometer contact must be disengaged before removing the test vehicle.

5.15   Personnel in the test cell should avoid close proximity to the test vehicle when the 48" single-roll electric dynamometer roll cradle is raised or lowered.

5.16   The Horiba CVS control must always be in the "local" mode and the GPIB must be "ON" for automatic computer operation.

5.17   If the Horiba Analysis System power is completely shut down, the correct start-up procedure for system must be followed. See Attachment B for details.

5.18   The test can be aborted at anytime by clicking on the "Abort" button displayed on the CDTCS.

6. **Visual Inspection**

    6.1   Inspect the boots, gaskets, and connecting pipes used between the vehicle and the
            CVS for leaks.

    6.2   Inspect the 48" single-roll electric dynamometer and ensure that the contact is
            engaged and the "RUN MODE" is selected before driving the test vehicle.

    6.3   Verify that the power for all of the Horiba Analysis System components are on. If it
            is not, see Attachment B for details on the startup procedure.

7. **Test Article Preparation**

    If at anytime the test sequence needs to be aborted, cleck on the "Abort" button. If the test
    schedule aborts and you to can not make another selection, a display window may be behind
    another window and be waiting for more information. To see scroll through windows the
    hold down the <ALT> and then the <Tab> until you see the window you need and enter the
    data. The schedule will then abort and allow other selections.

    If the dyno has not been operated during the two-hour period immediately preceding the FTP,
    it must be warmed up for 15 minutes by operating at 30 miles per hour (mph) using a non-
    test vehicle or as recommended by the dynamometer manufacturer. If this is the first test of
    the day on a 48" single-roll electric dynamometer, a dyno warm-up procedure must be
    performed, followed by an automatic calibration procedure and parasitic loss calibration, if
    necessary.

    See Steps 7.6 and 7.7 for warm-up details.

    For the FTP, the vehicle must have been preconditioned by operation on chassis
    dynamometer through one cycle of the "EPA Urban Dynamometer Driving Schedule" (see
    TP 703). This must be followed by a 12-36 hour soak, refueling, and if required per CFR
    86.130, canister preconditioning.

    The HFET is designed to be performed immediately following the FTP. In the event the test
    cannot be scheduled within 3 hours, which may include a 1-hour hot-soak evaporation loss
    test, the vehicle must be preconditioned (TP 703). If the vehicle been moved outdoors, or to
    environments where the soak temperature is not controlled, it must be soaked at 68-86 °F for
    a minimum of 4 hours prior to performing the preconditioning UDDS in order to properly set
    tire pressure.

    Unless otherwise indicated, the driver is responsible for ensuring that the following
    preparatory steps are performed.

7.1   On Form 730-01, verify that the Vehicle ID # and Test Number are correct.

7.2   The following steps are done only at the start of each day.

    7.2.1   Print the CYSITE SPCN report and verify that all the bottle names match the names posted on each Horiba site in the control room. If not, the span point must be updated. See Attachment C for details.

        If there are no changes, put your ID# and date on the report. Replace the old report with the new report.

        Place a check mark on Form 730-01.

    7.2.2   Verify that the CVS is local mode and that the GPIB="ON." If the GPIB ="OFF" push the "System" button on the CVS front panel. Push "3" for the "CNTL" screen then push "1" to put the GPIB ="ON."

        The MEXA bench must be in the on line mode. If it is not, click on the upper right corner "OFFLINE" button and it will change to "ONLINE."

        Place a check mark on Form 730-01.

    7.2.3   Verify that all SHS filters are installed correctly and clean. See Attachment D for details.

        Place a check mark on Form 730-01.

    7.2.4   On the CDTCS, under the "Testrun" menu item select "Test Schedules" and the select "LeakCheckBags." Each bag, one at a time, will be evacuated until a vacuum of 20 inches of mercury is obtain. Then the leak check will last for 1 minute. If any bag fails, see senior technician for instructions on manual checking of that bag. If the leak check fails again, the bag must be replaced and leak checked before proceeding.

        Place a check mark on Form 730-01 when all bags pass the leak check.

    Note: The dyno warm-up procedure should begin during the bag leak check process.

7.3   Enter the required VDA information and push <Command-S>. If needed, see Attachment E for details on entering required information.

    Place a check mark in the corresponding space on Form 730-01.

7.4   Approximately 10 minutes before the test is to begin, notify the manufacturer's representative. If a representative cannot be reached within 10 minutes, begin the test. The test may be delayed for 5 additional minutes if the representative is observing a test on another dynamometer, providing the other time constraints are not violated.

7.5   Ensure that the test cell air handling system is operating and in the "Test" position and power is applied to the dew-point hygrometer. Fuel Economy Data Vehicles only: The dry-bulb temperature should be 75 ±2 °F and the humidity controller should be set such that the dew-point hygrometer reads 45-50 °F (the target is 47.5 °F) at the start of the test. The dew-point hygrometer flow setting must be 2.0 standard cubic feet per hour (scfh).

If the dew point reading is outside the range of 42-52 °F at any point during the test, adjust the humidity controller slightly as needed to return the dew point to the 45-50 °F range. If the dry-bulb temperature or dew point is not within its respective limits, notify the senior technician and/or the Building Service Contractor.

See Attachment F, "Specific Humidity Specifications Range For Fuel Economy Tests" for a chart showing the dew-point endpoints.

If the dew point exceeds these tolerances, use the dew point and barometer values from TAP and calculate the specific humidity using the Excel "Humidity Calc. 3.0" program. Ensure the specific humidity is 30-70 gr/lb.

Place a check mark on Form 730-01.

7.6   If the dynamometer (hydrokinetic or electric) has been operated within the last 2 hours, record the dyno's last usage time on Form 730-01 and go to Step 7.8.

If the twin-roll hydrokinetic dyno has not been warmed, the following steps describe the warm-up procedure. For the 48" single-roll electric dynamometer warm-up procedure, go to Step 7.7 for details.

Note: The dyno may be warmed with the test vehicle if a preconditioning LA-4 is required for the HFET. The test vehicle can not be used to verify the horsepower.

7.6.1   Drive the warm-up vehicle onto the dynamometer and position the drive wheels on the rolls.

7.6.2   Ensure that the dyno roll brake is engaged.

7.6.3   Set the dynamometer inertia weight (equivalent test weight) to the value specified for the vehicle.

7.6.4   Check that the indicated horsepower (IHp) is set correctly. The IHp is obtained from the chart of actual horsepower (AHp) vs. IHp, posted on each dyno.

At Thermo the AHp required is not listed, calculate the IHp using the coefficient for the specific inertia weight on the chart. Use the "ASTM Rounding Off Procedure" to determine the correct horsepower to the tenth place. The coefficient will be different for each dyno; therefore, be sure to use the chart posted on the dyno.

7.6.5   Press the dyno "Index" light button, located on the Road Load Power Control (RLPC) box.

While the light is flashing, select the indicated horsepower using the thumbwheels on the dyno RLPC box. Ensure that the horsepower is set during the flashing light sequence; if it is not set during this period, press the index light again and enter the horsepower while the light is flashing.

If the light either fails to flash or will not stop flashing, notify senior technician.

7.6.6   Release the dyno roll brake when the "Index" light stops flashing.

7.6.7   Ensure that the correct inertia weights are engaged by lifting the cage and rolling the flywheels with your foot.

7.6.8   Center the drive wheels on the dyno rolls by operating the vehicle in a forward gear momentarily until the vehicle is centered. Ensure that the drive-tires have adequate side clearance from the dynamometer frame so they will not rub and become damaged.

If the vehicle fails to center properly, or there is not adequate clearance, notify the senior technician.

7.6.9   Connect the vehicle restraint system. The rear-drive system must have the slack removed and allow approximately 4 inches of play at the center of the cable or strap. The front-drive system must have the slack removed and allow approximately 2 inches of play at the center of the cable or strap.

Do not over tighten the cable.

7.6.10   Connect the vehicle exhaust to the exhaust scrubber system or CVS unit.

If the CVS is used, ensure that the CVS exhaust hose is inserted in the exhaust scrubber system and it is not crimped.

7.6.11   Open the hood or engine compartment cover.

7.6.12   Position the cooling fan(s) within 12 inches of the vehicle (unless otherwise specified) and turn the power to the cooling fan(s) on.

7.6.13   Place the wheel chocks in front of the non-drive wheels.

If airplane style chocks are used, position each around a non-drive wheel of the vehicle and tighten them until they fit snugly around the tire.

7.6.14   If the vehicle is connected to the CVS sample collection unit, turn the CVS blower on.

7.6.15   Accelerate the warm-up vehicle to 30 mph and maintain that speed for a minimum of 15 minutes.

7.6.16   While maintaining 30 mph, switch the front/rear roll switch to the front roll position.

7.6.17   Accelerate the warm-up vehicle to 50 mph front roll speed and verify the horsepower meter reading. Horsepower readings must be within 0.2 Hp of the thumbwheel set point. Out-of-tolerance readings should be reported immediately to the senior technician.

7.6.18   After the horsepower verification, return the front-rear selector switch to the rear roll position.

7.6.19   On Form 730-01, in the "Record last dyno usage time" section, record the time at the end of the warm-up (or preconditioning LA-4). The test must begin within 2 hours after the dynamometer was last operated.

7.6.20   Disconnect the warm-up car from the CVS or exhaust scrubber system. Disconnect the vehicle restraint system, remove the wheel chocks, move the cooling fan(s) out of the way, engage the dynamometer roll brake, and drive the vehicle out of the test cell.

7.6.21   On Form 730-01, record the warm-up end time in the "Last dyno usage time:" area.

7.6.21   Go to Step 7.8.

7.7   The following steps describe the prep sequence for the 48" single-roll electric
        dynamometer and are performed using the RTM-200 computer, keyboard, and
        monitor located in the test site control room. The symbols < > are used to indicate a
        key on the computer keyboard.

        Example: Push <1> to start. This means that you need to push the key labeled "1" to
        start the device.

        Comments may be entered during warm-up, automatic calibration, and parasitic loss
        calibration after pressing <F2>.

         If it is not, the test is void. See Attachment G for a flow diagram of this process.

Note: For 48" single-roll electric dyno power start-up and power shutdown procedures, see
         TP 703, Sections 7 and 8.

        7.7.1   Select "Warm Up" from the "DYNAMOMETER MAIN MENU" screen.
                  The screen will appear in the setup mode.

                  If warning messages are displayed, address the warnings, see "Horiba
                  Dynamometer Operations Manual."

        7.7.2   Look at the monitor screen and ensure the following:
                       "BRAKE" is "OFF" by pressing <F4>
                       "CRADLE" is "DOWN" by pressing <F6>
                       "COVER " is "ON" by pressing <F5>

        7.7.3   Start the dyno warm-up by pressing <F1>. After approximately 5.5
                  minutes, the message "DYNO IS WARM" will appear at the top of the
                  screen.

                  If a message other than "DYNO IS WARM" appears, contact the senior
                  technician.

        7.7.4   Return to the setup mode of the "WARM UP" screen by pressing <F1>.

        7.7.5   Stop the rolls by pressing <F8>, then <Enter>.

        7.7.6   Record the time at the end of the warm-up in the "Record last dyno usage
                  time" section on Form 730-01. The test must begin within 2 hours after the
                  dynamometer was last operated.

        7.7.7   If the automatic calibration procedure has already been performed for the
                  day, go to Step 7.8. An automatic calibration procedure should be
                  performed on a 48" single-roll electric dynamometer following the first
                  warm-up procedure of each day.

7.7.8   From the "DYNAMOMETER MAIN MENU" screen, select "Automatic Calibration." The "AUTOMATIC CALIBRATION" screen will appear in the setup mode.

7.7.9   Start the calibration by Pressing <F1>. Measurements will be automatically taken at the "OFFSET READING SPEED" of 5 mph. Upon completion, the message "Test Done" will appear on the screen. Press <F1> to return to the setup mode.

7.7.10   Look at the "Change" row. The value under "OFFSET" should be less than 0.5 pounds and the values under "+SHUNT" and "-SHUNT" should be less than 2 pounds.

7.7.11   If the change in the "OFFSET" is more than 0.5 pounds or the change in the "SHUNT" value(s) is more than 2 pounds:

Update the values by pressing <Y> in response to the prompt "USE THESE VALUES NOW? (Y/N)."

Print the "AUTOMATIC CALIBRATION" screen data by simultaneously pressing <Alt> and <P>. Forward the printout to the senior technician.

Exit the setup mode by pressing <F1>. The dyno will automatically rerun the automatic calibration.

If the change in the "OFFSET" is more than 0.5 pounds or the change in the "SHUNT" values is more than 2 pounds after rerunning the automatic calibration, print the "AUTOMATIC CALIBRATION" screen data by simultaneously pressing <Alt> and <P> and stop pending determination of the dyno status by the senior technician.

If the "OFFSET" value shows a change of more than 0.5 pounds after completion of the 5 mph reading, the automatic calibration may be stopped manually, the new "OFFSET" values updated, and the "AUTOMATIC CALIBRATION" screen data printed. This allows the automatic calibration to be rerun before the "SHUNT" checks are completed and permits adjustment of the "OFFSET" values without affecting the "+SHUNT" and "-SHUNT" values.

7.7.12   If the "OFFSET" is less than 0.5 pounds and the "+SHUNT" and "-SHUNT" values are less than 2 pounds:

Press <F1> to return to the setup mode.

Press <N> in response to the prompt "USE THESE VALUES NOW? (Y/N)."

If the "OFFSET" or "SHUNT" values were not updated, go to Step 7.8.

If the "OFFSET" or "SHUNT" values were updated, print the "AUTOMATIC CALIBRATION" screen data by simultaneously pressing <Alt> and <P> and forward the printout to the senior technician. A Parasitic Loss Calibration procedure must be performed.

7.7.13   From the "DYNAMOMETER MAIN MENU" screen, select the password-protected "Parasitic Losses." The "PARASITIC LOSSES" screen will appear in the setup mode.

7.7.14   Ensure that the proper speed points are displayed in the data table at the right of the screen. The speed points are 5-80 mph in increments of 5 mph unless otherwise specified by the test requester.

7.7.15   Ensure the following:

"BRAKE" is "OFF" by pressing <F4>

"CRADLE" is "DOWN" by pressing <F6>

"COVER" is "OFF" by pressing <F5>

7.7.16   Exit the setup mode and start the parasitic losses calibration, by pressing <F1>. When the calibration is complete, the prompt "TEST DONE" will appear on the screen and the dyno will automatically decelerate to a 50-mph warm-up speed.

7.7.17   Return to the setup mode by pressing <F1>. The prompt "USE THIS NEW LOSSES CURVE? (Y/N)" will be displayed on the screen.

7.7.18   Look under the "Change LBS" column. The value at any corresponding
speed point should not exceed 1.0 lb and the "CURVE FIT r^2" value (lower
center of the screen) should be 0.996 or greater.

If the "CURVE FIT r^2" value is less than 0.996:

Press <Y>. in response to the screen prompt "USE THIS NEW LOSSES
CURVE? (Y/N)." The loss curve will be saved in the archives, and the
dynamometer will return to the setup mode.

Rerun the parasitic losses calibration by pressing <F1>. If the "CURVE
FIT r^2" value is less than 0.996 again, stop the dyno prep pending
determination of the dyno status by the senior technician. Print the
"PARASITIC LOSSES" screen data by pressing <Alt> and <P> and
forward the report to the senior technician.

If the change in parasitic loss at any speed point exceeds 1.0 lb, indicated by
an asterisk alongside the corresponding speed point in the "Change LBS"
column, and if the "CURVE FIT r^2" value is 0.996 or greater:

Press <Y>. in response to the screen prompt "USE THIS NEW LOSSES
CURVE? (Y/N)." The loss curve will be saved in the archives, and the
dynamometer will return to the setup mode.

Print the "PARASITIC LOSSES" screen data by pressing <Alt> and
<P> and forward the report to the senior technician.

If the change in parasitic loss at any speed point does not exceed 1.0 lb for
the corresponding speed points in the "Change LBS" column and the
"CURVE FIT r^2" value is 0.996 or greater, press <N>. The loss curve will
be saved in the archives and the dynamometer will return to the setup mode.

7.7.19   Stop the dynamometer by pressing <F8> followed by <Enter>.

7.7.20   Print the Horiba Electric Dynamometer Automatic Calibration Report. See
Attachment H for an example of the report.

7.7.21   On Form 730-01, record the warm-up end time in the "Last dyno usage
time:" area.

7.8   Verify that the test number has been entered on the VDA and the <Command-S> keys have been pushed. On the CDTCS computer, under the "Testrun" menu item select "Test Schedules." See Figure 1.
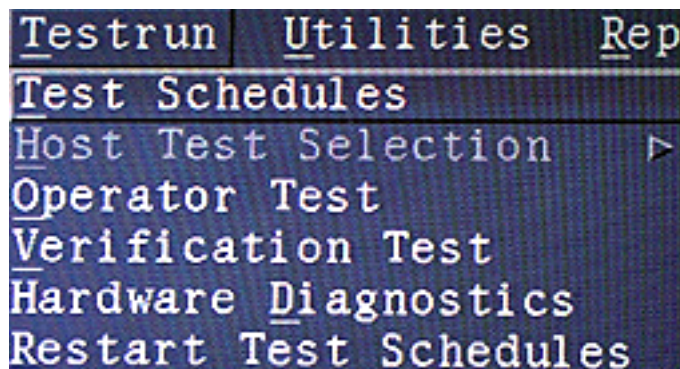

Figure 1

7.7   On the "Test Schedule File Selection" screen, in the "Files" section select "VDA Emission Test" and then click on the "Run Test" button. See Figure 1
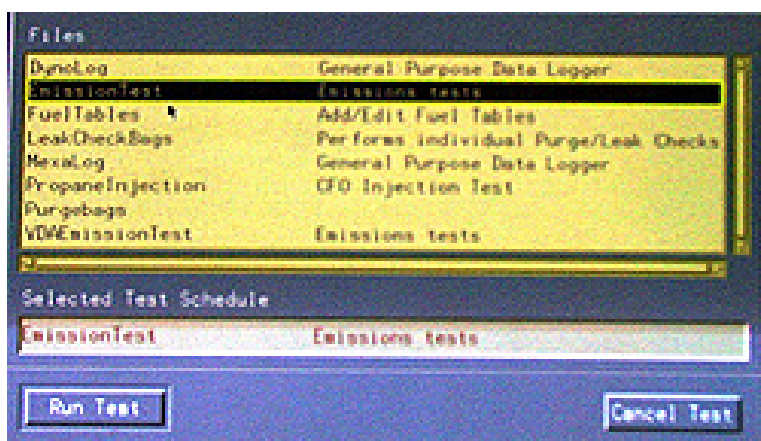

Figure 2

7.8   On the "Operator Selection" screen, select the answer file (P_19990231002.txt or P_19990088028.txt as examples) that corresponds to the test number for the vehicle to be tested. See Figure 3. Click on the "Enter" button.

If the test number (Answer File) is not available it must be transferred to the CDTCS computer. See Attachment I for details.
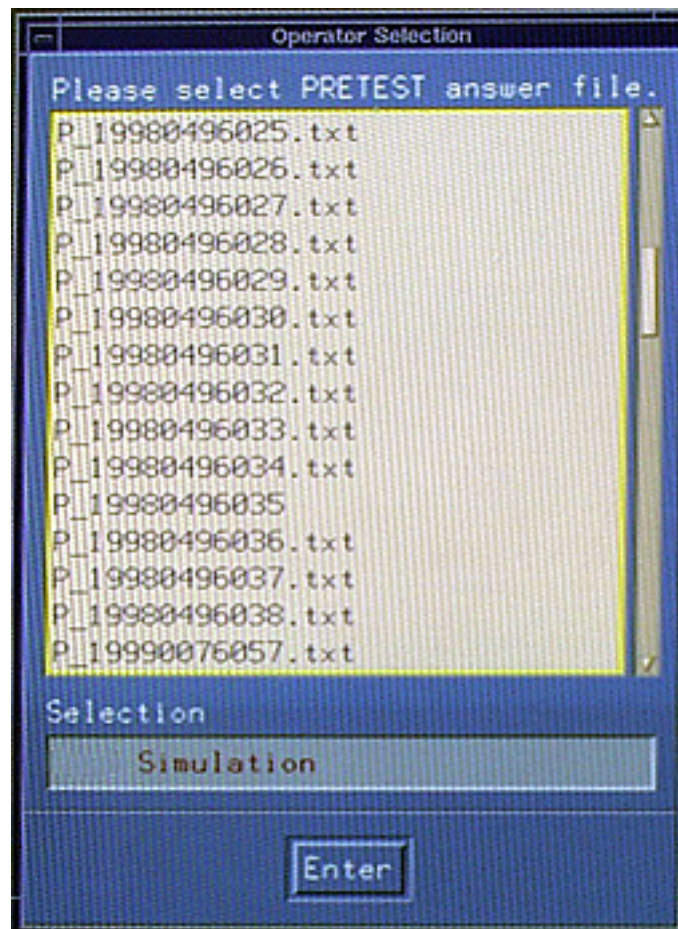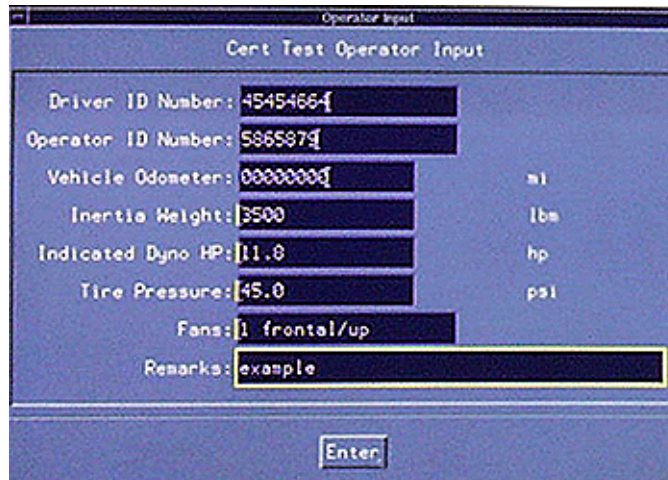

Figure 3

7.9   On the "Operator Input - Cert Test Operator Input" screen, enter the Driver ID
       Number, Operator ID Number (optional), Vehicle Odometer, Inertia Weight,
       Indicated Dyno HP, Tire Pressure, Fans, and any remarks that are relevant to this test.
       See Figure 4.

       Click on the "Enter" button.

Figure 4

7.10   On the "Operator Selection" screen, select the fuel container that was recorded on the
       "Test" fuel ticket. See Figure 5. Click on the "Enter" button.

Figure 5

7.11   On the "Operator If Question" screen you have 2 options. One option is to "Get Different Fuel Container" and the other is "Continue Test." See Figure 6. If the container ID is correct, click on the "Continue Test" button. If not click on the "Get Different Fuel Container."
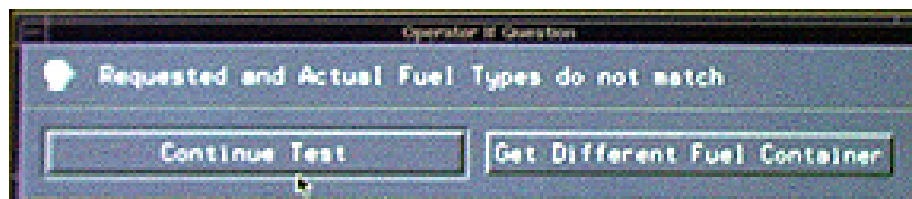

Figure 6

7.12   The "Operator If Question Cert Test Settings" screen will appear. See Figure 7. Click on the "Accept Settings" button if no changes are needed. If you need to change any inputs, click on the "Change Settings" button.
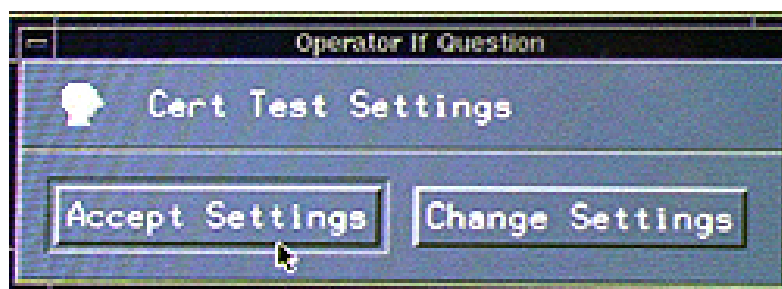

Figure 7

7.13   On Form 730-01, place a check mark in the "Test activated in CDTCS."

7.14   On Form 708-01, record the following:
　　　　Driver ID .... Row C, Columns 14-18
　　　　Dyno Site............. Row C, Columns 24-27
　　　　Odometer............. Row C, Columns 37-42
　　　　Tire Pressure........ Row C, Columns 43-46
　　　　CVS Unit............. Row C, Columns 61-63

8.   Test Procedure

Form 730-01 provides a checklist to verify that each step on the form is completed, thereby ensuring orderly execution of the test procedure. Tests using the twin-roll hydrokinetic dynamometer, follow the instructions in all sections except Sections 200 and 600. Tests using the 48" single-roll electric dynamometer, follow the instructions in all sections except Sections 100 and 500.

Unless otherwise indicated, the driver is responsible for ensuring that the following steps are performed.

100   Twin-roll dyno setup

101   For the FTP, do not start the engine, place the drive wheels of the vehicle on the dynamometer rolls, and leave the vehicle in neutral.

For the HFET, drive the vehicle onto the dynamometer, place the drive wheels on the dynamometer rolls, and leave the vehicle in neutral.

102   Verify that the dynamometer inertia weight (equivalent test weight) is correctly set to the VSR value specified for the test vehicle.

103   Verify that the indicated horsepower (IHp) is set correctly. The indicated horsepower vs. actual horsepower (AHp) chart is posted on each dyno.

If the required AHp is not listed, calculate the IHp using the coefficient for the specific inertia weight on the chart. Use the "ASTM Rounding Off Procedure" to determine the correct horsepower to the tenth place. The coefficient will be different for each dyno; therefore, be sure to use the chart posted on the dyno.

104   Press the dyno "Index" light button, located on the Road Load Power Control (RLPC) box.

105   While the light is flashing, select the indicated horsepower using the thumbwheels on the dyno RLPC box. Ensure that the horsepower is set during the flashing light sequence; if it is not set during this period, press the "Index" light button again and enter the horsepower while the light is flashing.

If the light either fails to flash or will not stop flashing, notify the senior technician.

If it is not set correctly, press the dyno "Index" light button. While the light is flashing, select the indicated horsepower using the thumbwheels on the dyno RLPC box.

106   Release the roll brake when the dyno "Index" light stops flashing.

Place a check mark on Form 730-01 indicating that the IHp and Inertia weights have been correctly set.

107   Ensure that the front/rear roll switch is in the "Rear Roll" position. Place a check mark on Form 730-01.

108   Center the vehicle drive wheels on the dyno rolls by turning the rolls with your foot until the vehicle is centered, and ensure that the correct inertia weights are engaged. Leave the vehicle in neutral. Ensure that the drive tires have adequate side clearance from the dynamometer frame. If the vehicle fails to center properly, notify the senior technician.

       If centered, place a check mark on Form 730-01.

118   Go to Step 300.

200   48-Inch Single-Roll Electric Dyno Setup

Note: Cradle and centering functions can be controlled by either the CTM250G micro-terminal at the driver's station or the RTM-200 computer keyboard in the site control room.

201   Retract the roll covers of the 48" single-roll electric dynamometer by pressing the "COVER ON/OFF" button on the CTM250G Driver's Station.

       Personnel in the test cell should avoid close proximity to the vehicle when the 48" single-roll electric dynamometer roll cradle is raised or lowered.

202   Raise the roll cradle by pressing the "CRADLE UP/DOWN" button on the CTM250G Microterminal.

203   To engage the dyno contact, press <START> on the CDC-900 cabinet or <START> on the remote driver's station pendant.

204   For the FTP, do not start the engine, place the drive wheels of the vehicle on the dynamometer roll, and leave the vehicle in neutral.

       For the HFET, drive the vehicle onto the dynamometer, place the drive wheels on the dynamometer roll, and leave the vehicle in neutral.

205   Center the vehicle by pressing the CTM250G Microterminal "CENTERING START/STOP" button.

206   In response to the prompt on the CTM250G Microterminal screen, use the CTM250G driver's station keyboard to enter the value specified for the VSR vehicle weight (equivalent test weight).

       The "CENTERING START/STOP" button on the CTM250G Microterminal will remain lit, and the RTM-200 computer screen will show acceleration to a speed of 1 mph while the rolls are turning.

207 Position one of the wheel chock assemblies around a non-drive wheel of the vehicle. Insert the linkage bar locking nuts in the tee-slot tracks.

208 Slide the moveable wheel chock so that both parts of the chock assembly fit against the tire and draw the chocks firmly together against the tire by turning the handle clockwise on the threaded rod.

209 Secure the locking nuts which bolt the free end of the linkage bars to the tee-slot tracks.

210 Repeat Steps 208 through 210 to position the other wheel chock assembly against the other non-drive wheel of the vehicle.

211 Visually ensure that the front and rear cradle rolls are turning at about the same speed and the vehicle drive wheels are positioned approximately at the roll surface crown.

   If not, adjust the wheel chock positions until the rolls appear to be turning at the same speed.

212 Stop the rolls by pressing the CTM250G "CENTERING START/STOP" button.

213 Lower the cradle by pressing the CTM250G "CRADLE UP/DOWN" button. Place a check mark on Form 730-01.

214 Cover the exposed portion of the rolls by pressing the CTM250G "COVER ON/OFF" button.

215 Check and, if necessary, adjust the drive tires to the manufacturer's recommended pressure per the VSR, unless otherwise specified.

216 Use the RTM-200 computer keyboard for this step through Step 226. Select "ROAD SIMULATION" from the "DYNAMOMETER MAIN MENU" screen.

217 Ensure that the "BRAKE" is "OFF" and the "CRADLE" is "DOWN," and observe that the rolls are not moving.

218 Obtain the "VEHICLE SIMULATION PARAMETERS" screen by pressing <F2>.

219 Select the appropriate vehicle ID by pressing <PgUp> or <PgDn>. The vehicle ID will be shown next to "Class" on the screen.

220 Recall or enter the correct test number, inertia (ETW), and A, B, and C coefficients. The A, B, and C coefficients are in the comments section of the VSR. Place a check mark on Form 730-01.

221   Look at the RTM-200 computer screen and ensure that the "Augmented Braking" is
        "OFF," unless indicated otherwise on the VSR. Use the right or left arrow key to
        turn "Augmented Braking" either "ON" or "OFF."

222   Use the right or left arrow key to select "NO" for "Grade" simulation.

223   To return to the "SETUP MODE" of the "ROAD SIMULATION" screen, press
        <Esc>.

224   If no warning messages are displayed, press <F1>, followed by <Esc> to return to
        the "RUN MODE."

225   If warning messages are displayed, address the warning (see "Horiba Dynamometer
        Operations Manual"), then press <F1>, followed by <Esc> to return to the "RUN
        MODE." Place a check mark on Form 730-01.

300   Test Vehicle Dynamometer Hookup

301   Connect the vehicle restraint system. The rear-drive system must have the slack
        removed and allow approximately 4 inches of play at the center of the cable or
        strap. The front-drive system must have the slack removed and allow
        approximately 2 inches of play at the center of the cable or strap. Do not over
        tighten the cable.

        If using the electric dyno, use the restraint system designed for that type
        dynamometer.

        Place a check mark on Form 730-01.

302   Use the required connectors and flexible hose to connect the vehicle exhaust system
        to the Horiba Analysis System CVS. Place a check mark on Form 730-01.

303   Open the hood or engine compartment cover.

304   Position the cooling fan(s) within 12 inches of the vehicle (unless otherwise
        specified) and turn the power to the cooling fan(s) on.

        Place a check mark on Form 730-01 indicating that the hood is up and fan is
        operational.

305   On Form 730-01, use the drawing of the vehicle and indicate the fan placement.

306 Place the wheel chocks in front of the non-drive wheels.

If airplane style chocks are used, position each around a non-drive wheel of the vehicle and tighten them until they fit snugly around the tire.

307 Check that all accessory switches on the test vehicle are in the "Off" position prior to starting the engine. Place a check mark on Form 730-01.

308 Check and, if necessary, adjust the drive tire pressure to 45 psi, unless otherwise specified. If other than 45 psi, record tire psi set.

309 Ensure that the correct starting procedures are located in the vehicle. If they are not, contact the senior technician.

400 VDA System and CDTCS Exhaust Sample Analysis

401 On Form 730-01, verify that each item is checked off. This will ensure that the equipment and the test vehicle have been properly set up for testing and that all preparatory steps have been completed by the driver.

If at any time there is a CVS problem detected by the CDTCS, a warning light will be activeted on the VDA stand. The driver must immediately stop the vehicle and turn the engine off.

402 Before driving the test vehicle on the 48" single-roll electric dynamometer, ensure that it is in the "RUN MODE" and the contact has been engaged.

Under the "Test" menu, position the mouse pointer on "Test" and press and hold down the mouse button, opening the "Test menu." Continue to hold down the mouse button, pull the mouse toward you, and position the pointer on "Setup for Driving;" then release the mouse button to select it. See Figure 8.
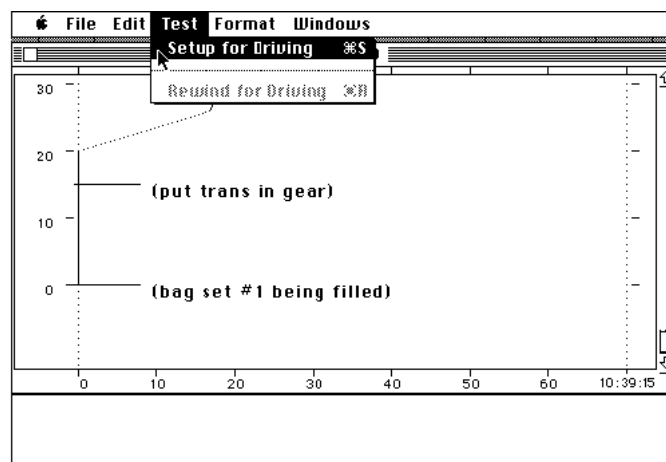

Figure 8

403   Verify that the CVS blower and cooling fan(s) are on prior to starting the test.
Verify that the indicators on the VDA screen for "Blower" and "Pump" are on.
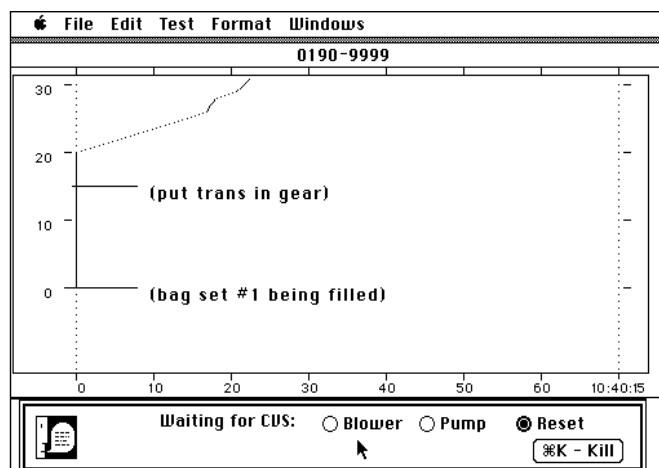
See Figure 9.

Figure 9

404   Before starting the engine, ensure that the "Ready" indicator on the bottom of the
VDA screen is on. See Figure 10. If the test vehicle is in the Recall program, start
the engine according to the technical directive instructions for this vehicle. If the
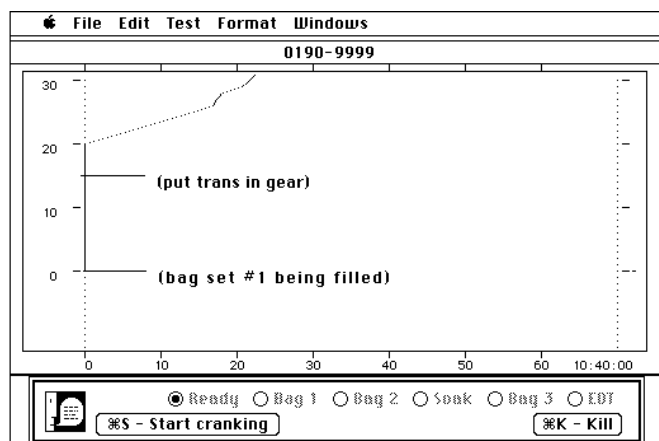test type is HFET, go to Step 439

Figure 10

405   Simultaneously start the test vehicle's engine, according to the manufacturer's recommended starting procedures, and press <Command S>. If the engine starts and continues to run, go to Step 407. If the vehicle does not start after 10 seconds of cranking, the cranking shall cease and the reason for failure to start shall be determined. Select the "Hold cranking > 10 sec." button at the bottom of the screen by pressing <Command-Space Bar>. See Figure 11
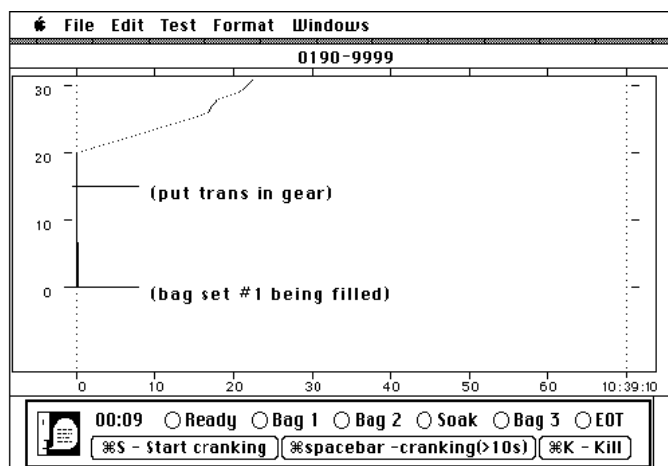
Figure 11

The "Hold sampling" button will now appear on the bottom of the screen. See Figure 12. The CVS sample selector valves shall be turned off by pressing <Command-Space Bar>.
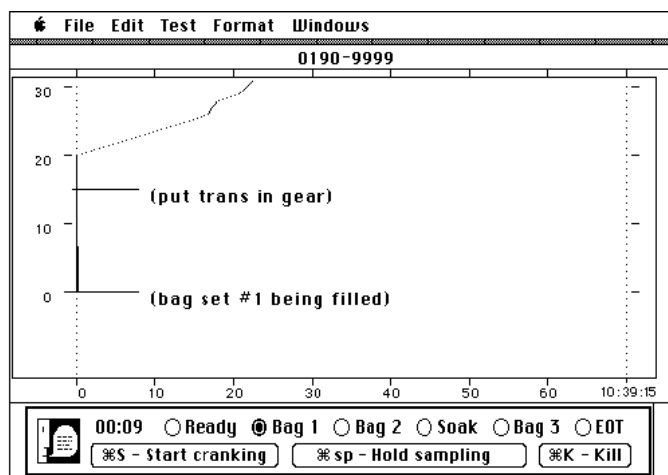
Figure 12

In addition, the CVS compressor (blower) and cooling fan(s) shall be turned off during this diagnostic period. V-Mix counts are not zeroed or reset prior to attempting to restart the vehicle. After an unsuccessful start attempt, notify the senior technician, the manufacturer's representative (certification vehicles), or the appropriate EPA Task Officer (in-use vehicles) for further instructions.

If the failure to start is determined to be a vehicle malfunction, corrective action of less than 30 minutes duration may be taken by the manufacturer's representative if accompanied by Certification personnel or the appropriate Task Officer.

If the failure to start is determined to be an operational error, the test will be void and the vehicle will be rescheduled for testing. Complete Form 902-01, obtain all approved signatures, and file with the data processor.

If the test vehicle is in the Recall program, start the engine according to the technical directive.

406 Second start attempt: If the test vehicle is in the Recall program, restart the engine according to the technical directive instructions for this vehicle. When you are ready to attempt to start the vehicle again, make sure that the CVS blower and sample pumps are on. Verify that the VDA "Ready" indicator is on.

If necessary, reset the VDA Control dialog box by pressing <Command-S> to select the "Try again" button. See Figure 13.
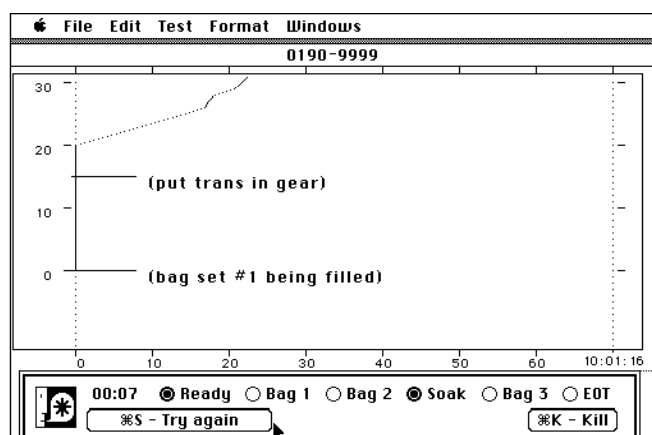
Figure 13

Simultaneously start the test vehicle's engine, according to the manufacturer's recommended starting procedures, and press <Command S>. If the engine starts and continues to run, go to Step 407.

If a second start is attempted and the vehicle does not start within 10 seconds of cranking, pause for 10 seconds and crank again. A total of not more than three 10-second cranks, with 10-second pauses between each crank, should be attempted. After three unsuccessful start attempts, notify the senior technician, the manufacturer's representative (Certification Vehicles), or the appropriate EPA Task Officer (In-Use Vehicles) for further instructions.

407   Press <Command S> to start the VDA trace scrolling. The crank time will be displayed on the left side of the dialog box. See Figure 14.

       If the key has not been turned to the start position and you need to stop, simultaneously press the <Command> key and the space bar to stop scrolling. Select "Re-set up Test" in the control dialog box. To reset the trace with the mouse pointer, point the arrow on the "Re-set up Test" box and click the mouse one time. Return to Step 402.
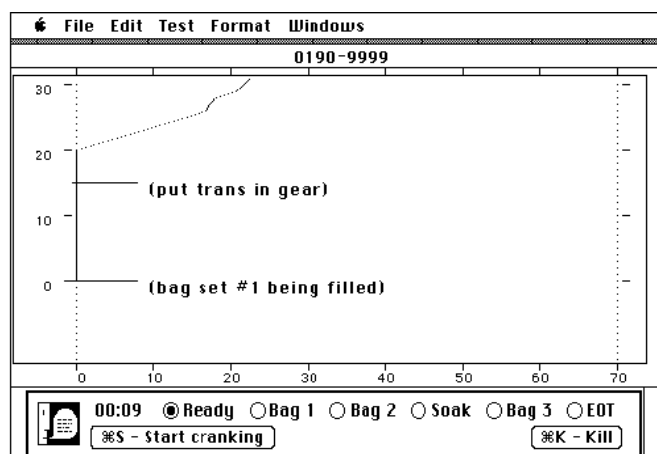
Figure 14

408   Verify that the "Bag 1" indicator is on.

409   If the engine false starts (i.e., does not continue to run when the ignition switch is returned to the "ON" position following the cranking), repeat the recommended starting procedure, pausing for 10 seconds before cranking for 10 seconds, unless otherwise recommended by the manufacturer or appropriate Task Officer. Complete Form 902-01, obtain all approved signatures, and file with the data processor.

If the vehicle's engine false starts three times, cease cranking and notify the senior technician, the manufacturer's representative (Certification Vehicles), or the appropriate EPA Task Officer (In-Use Vehicles) for further instructions.

If the vehicle cannot be restarted before the initial acceleration, stop the VDA trace from scrolling by pressing <Command-Space Bar>. See Figure 15.
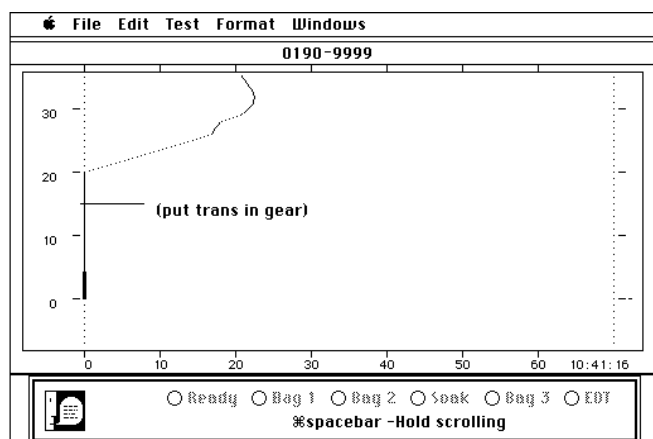
Figure 15

410   If the engine starts and continues to run, start the VDA trace scrolling by pressing <Command-S>, following the instructions at the bottom of the screen. See Figure 16.
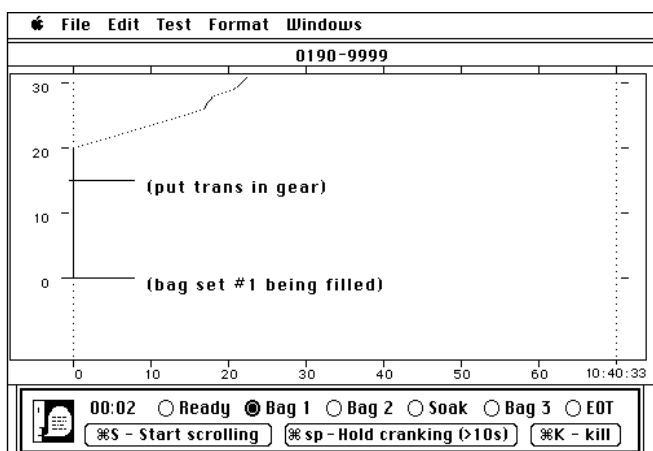
Figure 16

411   If you need to stop, select the Kill button by pressing <Command-K>. To resume
        the procedure, position the mouse pointer on "Test." Press and hold down the
        mouse button and pull down the "Test Menu." Position the pointer on the
        "Rewind" menu item and release the mouse button to select it.

        If you did rewind, go to Step 402, otherwise continue.

412   Operate the test vehicle as described in CFR 86.137 for the Urban Dynamometer
        Driving Schedule (UDDS). See Attachment J, "UDDS Specifications" for a list of
        driving techniques.

        If a condition occurs at any time during the driving of the UDDS that requires the
        driver to add a comment, press <~>. This will flag the data for entry of a comment
        at a time convenient for the driver.

413   If the vehicle is driven at WOT, indicate all places where this occurs on the driver's
        trace. See Section 600, Editing Driving Events (Entering Comments), for
        instructions.

414   At the 505-second point of the UDDS, the VDA will automatically switch to the
        second set of sample bags. See Figure 17.
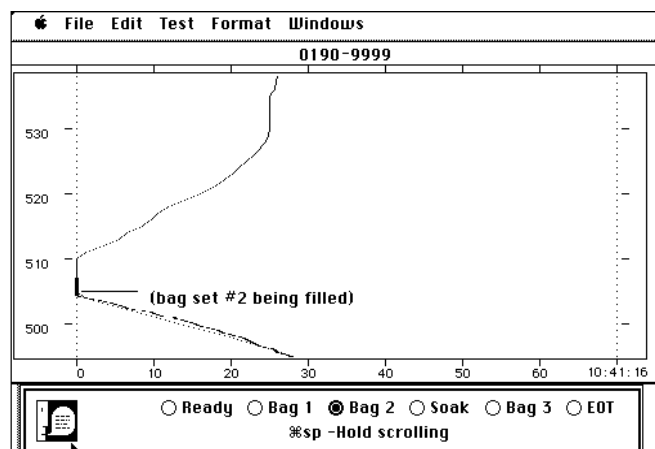
Figure 17

415   Two seconds after the end of the last deceleration of the UDDS (the 1369-second point on the driving schedule), turn the engine off.

416   When the engine stops running, press <Command-S>. Five seconds later, the sampling will automatically stop and the soak indicator on the VDA screen will light. See Figure 18. The VDA will automatically reset to the beginning of the next driving schedule.
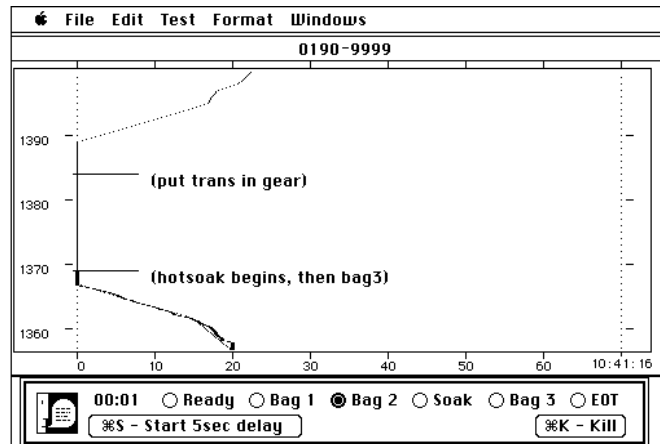
Figure 18

417   Verify that the vehicle hood is down and the power to the fan and CVS blower are turned off. Place a check mark on Form 730-01. The VDA also monitors the hot soak time on its screen. See Figure 19. The total soak time must be 10 minutes, ±1 minute.
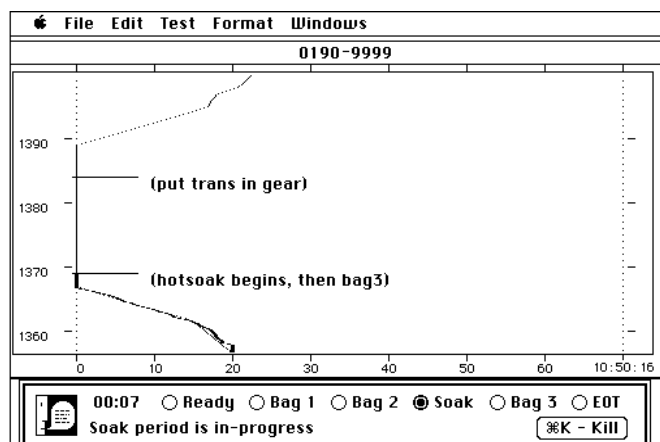
Figure 19

418   For Fuel Economy Vehicles only, monitor the cell temperature during the 10-minute soak, particularly for the first 4 minutes, to ensure that it does not exceed the tolerance of 68-86 °F. It is desirable to maintain the set point temperature of 75 °F.

        If the temperature drops below 72 °F, the reheat thermostat on the test cell air handling unit should be adjusted. If corrective action fails, notify the senior technician.

419   When the Horiba Analysis System, VDA, or CVS indicates that 9 minutes have elapsed open the vehicle's engine compartment cover. Verify that the cooling fan(s) are on.

420   If the required 10-minute soak (±1 minute) has been completed and the "Ready" indicator on the VDA screen is on, start the test vehicle's engine according to the manufacturer's recommended hot-start procedures and follow the instructions in the control dialog box at the bottom of the screen.

421   To start sampling, press <Command-S> and ensure that the "Bag 3" indicator is on; then crank the engine. See Figure 20.

        If the vehicle does not start within 10 seconds, see Steps 407 through 414 for details. The crank time will be displayed on the left side of the control dialog box.
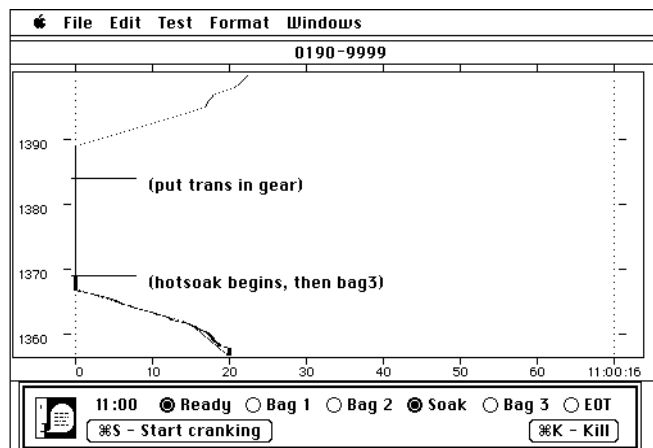
Figure 20

422   If the vehicle engine starts and continues to run, start the VDA trace scrolling by
        pressing <Command-S>, following the instructions at the bottom of the screen. See
        Figure 21.
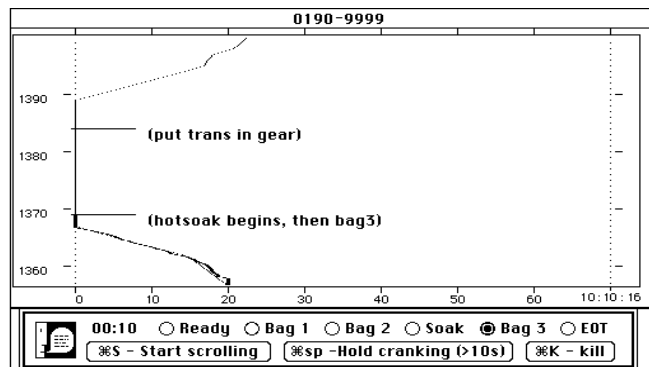
Figure 21

423   Drive the remainder of the test (hot-start transient phase, Bag 3) according to the
        UDDS.

424   At the 1874-second point of the UDDS, the VDA will automatically switch off the
        3rd set of sample bags. See Figure 22. The "EOT" indicator will come on and the
        VDA will automatically save the test data.
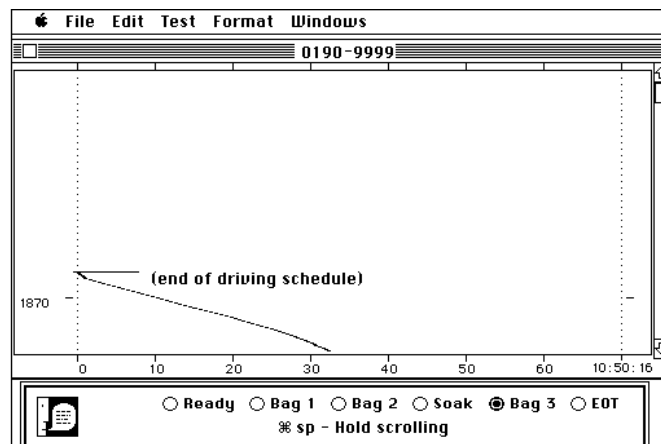
Figure 22

425   At the end of each bag set, the CDTCS will take a sample reading of the exhaust
sample bag concentration. It will determine what analyzer ranges to use for the
analysis. The following steps will be performed automatically after each bag set.

The CDTCS will set the zeros for each analyzer. See Figure 23.
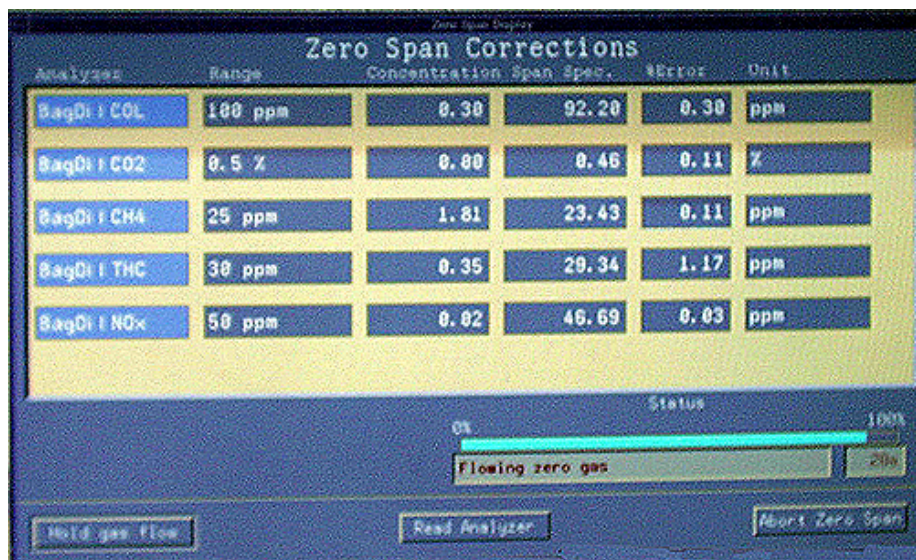
Figure 23

The CDTCS will set the spans for each analyzer. See Figure 24.

Figure 24

The CDTCS will take the exhaust sample bag readings for each analyzer. See Figure 25.

Figure 25

The CDTCS will take the background bag readings for each analyzer. See Figure 26.

Figure 26

The CDTCS will check that the zeros for each analyzer are within tolerance. If not within 2% of the initial setting the CDTCS will repeat the analysis process. See Figure 27.

Figure 27

The CDTCS will automatically check that the spans for each analyzer are within tolerance. If not within 2% of the initial setting the CDTCS will repeat the analysis process. See Figure 28.

Figure 28

426   If the vehicle requires a Sealed Housing for Evaporative Determination (SHED) hot-soak test, leave the engine running, apply the brakes, and remain seated while the vehicle is being disconnected from the dynamometer and sampling system.

         If not, go to Section 500 for vehicle removal from the twin-roll dyno or go to Section 600 for details on vehicle removal from the electric dyno.

         If a HFET is required, go to Attachment K for details. See Attachment L for an example of the HFET Video Drivers Aid Report.

427   The CDTCS will automatically print a report. This report must be stamped "Preliminary Laboratory Test Data. For Official Certification Data refer to CFEIS Report."

500   Vehicle Removal - Twin-Roll Dyno

501   Disconnect the restraint system and remove the wheel chocks from the vehicle.

502   Engage the dynamometer roll brake by pressing the red button on the dyno control panel.

4503   Close the vehicle engine compartment cover so that it is fully latched and move the cooling fan(s) out of the way. If insufficient time is available, another technician should assist.

504   Drive the vehicle off the dyno at the minimum necessary throttle. If a SHED hot soak is required drive the vehicle to the entrance of the evaporative SHED as soon as it is disconnected (see TP 709).

505   Go to Step 700.

600   Vehicle Removal - 48" single-roll electric dyno

601   Print the "DYNAMOMETER REPORT" by pressing <Alt> and <P> on the RTM-200 computer keyboard. Verify that the A, B, and C coefficients on the "DYNAMOMETER REPORT" correspond with the data on the VSR. If there are omissions, inconsistencies, or errors, notify a senior technician.

         If there are no omissions, inconsistencies, or errors, enter your technician ID number and the date on the "DYNAMOMETER REPORT" and place it in the test packet.

602   Press <F1> on the RTM-200 computer keyboard. The message "END THIS TEST NOW? Y/N" will appear on the screen. Selecting "Y" will save the data and return the controller to the "SETUP MODE."

603   On the RTM-200 monitor, verify that the positive and negative simulation errors are less than ±0.05%, respectively.

        If the average positive simulation error equals or exceeds 0.05% or the average negative simulation error equals or exceeds -0.05%, notify the senior technician. The test is void and the vehicle must be rescheduled unless the project manager deems it acceptable for the purpose of this test. Complete Form 902-01.

604   Press the contact "Stop" button on the CDC-900 cabinet.

605   Retract the roll covers by pressing the "COVER ON/OFF" button on the CTM250G Microterminal.

606   Raise the cradle by pressing the "CRADLE UP/DOWN" button on the CTM250G Microterminal.

607   Disconnect the restraint system from the vehicle by loosening the linkage bar locking nuts. Disengage and remove the wheel chock assemblies from the non-drive tires. Slide the assemblies away from the tires and, if necessary, lift the assembly out of the tee-slot tracks to provide more clearance. When the cradle is lowered, the vehicle could move slightly along the roll. Since the movement can be up to one foot in either direction, personnel in the test cell should avoid close proximity to the vehicle when the cradle is lowered.

608   Lower the cradle by pressing the "CRADLE UP/DOWN" button on the CTM250G Microterminal.

609   Apply the roll brake by pressing the "BRAKE ON/OFF" button on the CTM250G Microterminal.

610   Close the vehicle engine compartment cover so that it is fully latched and move the cooling fan(s) out of the way. If there is insufficient time available, another technician should assist.

611   When the vehicle has been removed from the dyno, close the roll covers by pressing the "COVER ON/OFF" button on the CTM250G Microterminal.

612   Drive the vehicle off the dyno at the minimum necessary throttle. If a SHED hot soak is required drive the vehicle to the entrance of the evaporative SHED as soon as it is disconnected (see TP 709).

700   **Editing Driving Events / Reviewing Preliminary Report**

701   To edit the "Summary Report," position the mouse pointer on the scroll arrow and hold down the mouse button until the "Out-of-Tolerance Events" are in view. See TP 703, Attachment G for more details. Out-of-tolerance events must be documented**.**

      Print the Video Driver Aid Report.   See Attachment M for an example of the report.

702   When editing is completed, the VDA will return to "Daily Tests Window."

703   On the Preliminary Laboratory Report, see Attachment N, verify that:

      the correct test number and vehicle ID are on the report

      the key start time is within 12 to 36 hours of the prep key off time

      the fuel type corresponds to the fuel type recorded on the "Test" fuel ticket

      the correct inertia weight and horsepower have been entered

      the samples were read within the 20-minutes

      the cranks times are less than 10 seconds

      for Fuel Economy Data Vehicles only, the dew point is between 42-52 °F

704   The site operator enters their EPA ID number and date in the appropriate space on Form 730-01.

800   **Post-Test Processing**

801   On the site NT computer desktop window, click on the "NVFEL.XLS" icon. See the arrow in Figure 29.
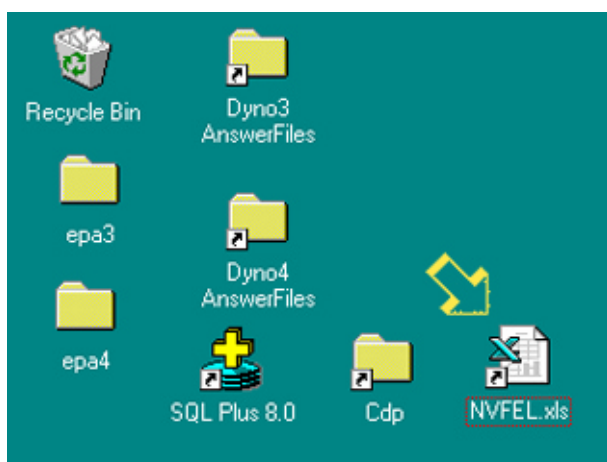
Figure 29
Desktop Window

The "NVFEL Laboratory Programs" window will open. See Figure 30.

802   Click on the "Vehicle Test Site" button. See the arrow in Figure 30.
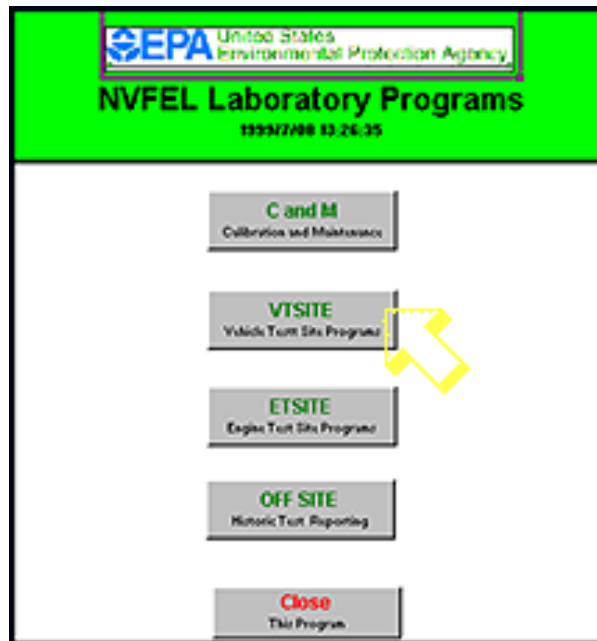
Figure 30
Vehicle Test Site Button

803   Click on the "Get Data" button. See the arrow in Figure 37.
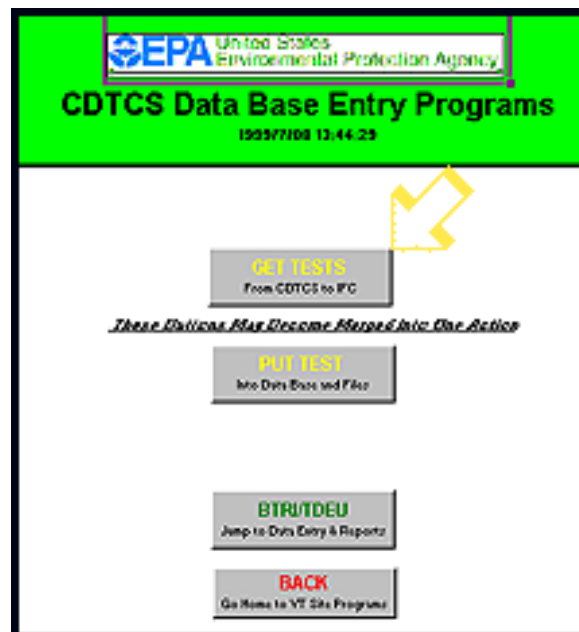
Figure 37
Get Data Button

The "Move Test File(s) From CDTCS to IFC" screen will appear. See Figure 38.

804   Under "Choose Test File(s)," click on the down arrow and select the test ID. See
        the arrow in Figure 38.
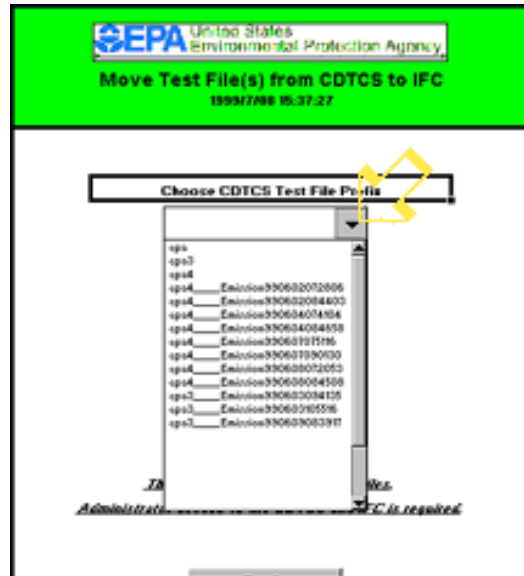
Figure 38
Chooose Test File(s) screen

805   Click on the "Transfer File(s)" button. See the arrow in Figure 39. The data will be
        transfered to CFEIS.
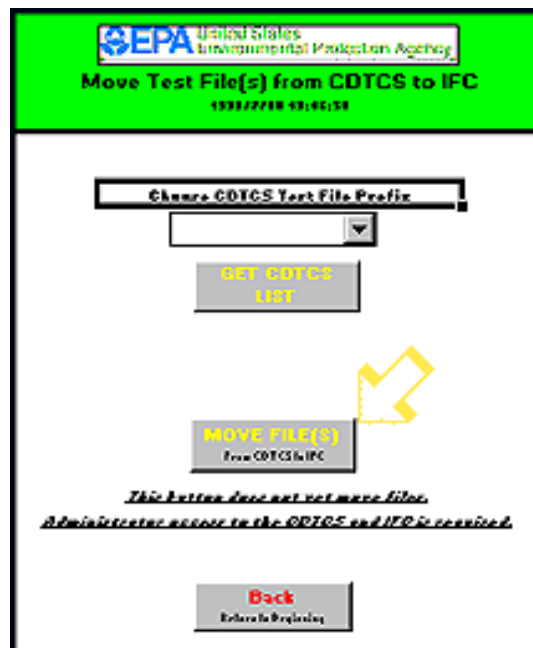
Figure 39
Transfer Files Button

806   To set up to process another test, go to Step 801.

To perform another function click on the appropriate button.

To exit "NVFEL Laboratory Programs," click on the "Close" button. The screen will return to the Windows Desktop.

9.   Data Input

9.1   The following information will automatically appear in the VDA vehicle test information dialog box when the test is selected:

Test number

Vehicle manufacturer (Mfr.)

Vehicle identification number (Veh ID)

Test Type

Test Procedure (Test Proc)

Test Schedule (Test Sch)

Shift Schedule (Shift Sch)

Drive Schedule (Drive Sch)

9.2   The driver enters the following information on the VDA test information dialog box:

Equivalent Test Weight (Eq Test Wgt)

Indicated dyno horsepower (Ind HP) for twin-roll hydrokinetic dynamometer, or the letters "COEF" for the 48" single-roll electric dynamometer

Driver Identification Number (Driver ID)

Dynamometer Site Number (Dyno Site)

9.3   The driver enters comments on the VDA driver's trace, for example WOT, stall, stumble, hesitation, trace spikes, and late or missed shifts.

9.4   The driver enters the following information on the CDTCS:

Vehicle odometer

Driver ID number

Interia weight

Indicated dyno horse power (IndDynHp)

Drive tire pressure

If a side fan is used enter "Yes" for side fan and position

If the operator ID is different than the driver ID

Remarks

9.5   On Form 730-01, the driver verifies "Vehicle ID" and the "Test Number" are correct and selects "FTP" or "HFET" as a test type. They also record the last dyno usage and complete the checks each section. When completed they record their EPA ID number and the date.

9.6   If a vehicle is tested without a test number the technician will enter the vehicle ID and dyno number in the CDTCS.

9.7   If the 48" single-roll electric dynamometer is used, the driver enters the following on the "Vehicle Simulation Parameters" screen of the RTM-200 computer (if not already entered):

Test number

Vehicle ID number

Inertia (ETW)

A, B, and C coefficients

9.8   If the 48" single-roll electric dynamometer is used, the driver obtains a "DYNAMOMETER REPORT" printout including a plot of simulation error.

10.   Data Analysis

The validation technician should be familiar with this procedure and should not have performed any of the preceding steps.

10.1   Review the VDA "Summary Report."

10.1.1   Verify that the following information agrees with the VSR:

Vehicle manufacturer (Mfr.)

Vehicle identification number (Veh ID)

Version

Test Type

Test Procedure (Test Proc)

Shift Schedule (Shift Sch)

Equivalent Test Weight (Eq Test Wgt)

Indicated dyno horsepower (Ind HP) for twin-roll hydrokinetic dynamometer, or the letters "COEF" for the 48" single-roll electric dynamometer)

The indicated horsepower is checked against the indicated horsepower vs. actual horsepower table located on each dyno. The actual horsepower is available on the VSR.

10.1.2   On Form 708-01, verify that the following information matches corresponding entries:

Test number

Driver Identification Number (Driver ID)

Dynamometer Site Number (Dyno Site)

10.1.3   Verify that all out-of-tolerance events have been addressed and the "STARTUP" times are less than 10 seconds.

10.1.4   If there are no omissions, inconsistencies, or errors on the VDA "Summary Report," enter your technician ID number and the date in the designated spaces.

If there are omissions, inconsistencies, or errors on either the VDA "Summary Report" or Form 708-01, notify a senior technician.

10.2 Review Form 708-01.

10.2.1 Verify that the following information has been entered correctly and agrees with the corresponding data on the VDA "Summary Report" and the VSR:

Actual Inertia Setting ... Row C, Columns 28-32

Indicated Dyno HP .... Row C, Columns 33-36 (Twin Roll Only)

Odometer .... Row C, Columns 37-42

Tire Pressure .... Row C, Columns 43-46

CVS Unit .... Row C, Columns 61-63

Fuel Container ID .... Row H, Columns 40-45

10.2.2 If there are no omissions, inconsistencies, or errors in the report, enter your technician ID number on card H, columns 16-20.

10.2.3 If there are omissions, inconsistencies, or errors in the report, notify a senior technician.

10.3 Review Form 730-01 and verify that all spaces have been checked, the drivers ID number and date have been entered. Verify that the Vehicle ID # and Test Number correspond to the VDA "Summary Report":

If there are no omissions, inconsistencies, or errors on the form, enter your technician ID number and the date in the designated spaces.

If there are inconsistencies or errors on the form, notify a senior technician.

10.4 Review the CDTCS Preliminary Laboratory Test Report.

10.4.1 Verify that the dyno and vehicle ID information agree with the VDA summary report to ensure that the correct test number was assigned to the dyno.

10.4.2 Verify that the key start time is within 12 to 36 hours from the prep key off time.

10.4.3 Verify that the fuel type corresponds to the fuel type recorded on the "Test" fuel ticket.

10.4.4 Verify that the correct inertia weight and horsepower have been entered.

10.4.5 Verify that all samples were read within the 20-minutes.

10.4.6   Verify that the cranks times are less than 10 seconds.

10.4.7   For Fuel Economy Data Vehicles only, ensure that the dew point is between 42-52 °F.

         If the dew point exceeds these tolerances, use the dew point and barometer values and calculate the specific humidity using the Excel "Humidity Calc. 3.0" program. Ensure the specific humidity is 30-70 gr/lb.

         If it is not, the test is void.

10.4.8   If all items have been complied, write "OK," your technician ID number, and the date at the bottom of the report

         If all items were not complied with, contact a senior technician.

10.5   If the 48" single-roll electric dynamometer is used, verify that the following information on the DYNAMOMETER REPORT is correct:

      The inertia (ETW) and the A, B, and C coefficients correspond to the VSR.

      The average positive simulation error is less than 0.05% and the average negative simulation error is less than -0.05%.

      If there are no omissions, inconsistencies, or errors on the Dynamometer Report, enter your technician ID number and the date on the report. If there are omissions, inconsistencies, or errors on the Dynamometer Report, notify a senior technician.

11. Data Output

11.1   Place Form 730-01 in the Test Packet.

11.2   Give the "Preliminary Laboratory Report" to the vehicle manufacturer.

11.3   If the 48" single-roll electric dynamometer is used, the following printouts are generated:

11.3.1   Print of the screen following automatic calibration of the 48" single-roll electric dynamometer when adjustments of the 5 mph "OFFSET" and/or adjustments of the + and - "SHUNT" values are made. The printout is forwarded to the senior technician.

11.3.2   Test report following parasitic losses calibration of the 48" single-roll electric dynamometer, when a parasitic loss curve is updated. The report is forwarded to the senior technician.

11.3.3   "DYNAMOMETER REPORT" printout including a plot of average simulation error. This report is placed in the test packet.

12. Acceptance Criteria

The following criteria must be met for the FTP to be valid:

12.1 The test vehicle must not exceed the ambient temperature tolerances of 68-86 °F and the average dew-point temperature must be within 35-55 °F. The dew point limits are for Fuel Economy Vehicles only.

12.2 Vehicles tested according to the 1978 test sequence and not scheduled for evaporative emissions testing shall be placed on a dynamometer and the engine started for the "Exhaust Emission Test" procedure within 1 hour of completion of the diurnal heat build.

12.3 The vehicle shall have been soaked for not less than 12 hours nor more than 36 hours prior to the start of the cold-start exhaust emission test.

12.4 For 1996 test sequence vehicles being tested for evaporative emissions, the evaporative canister must be preconditioned during the 12- to 36-hour soak period.

12.5 Ambient temperatures encountered by the test vehicle must remain within 68-86 °F at all times.

12.6 The VDA trace must be within the following UDDS speed tolerances:

12.6.1 The upper limit is 2 mph higher than the highest point on the trace within 1 second of the given time. The lower limit is 2 mph lower than the lowest point on the trace within 1 second of the given time.

12.6.2 Speed variations greater than the tolerances (such as may occur during gear changes, etc.) are acceptable provided they are less than 2 seconds in duration.

12.6.3 Acceptable speed variations may occur during gear changes, brake spikes, engine stumbling, etc.

12.6.4 Speeds lower than those prescribed are acceptable, provided the vehicle is operated at maximum available power during such occurrences.

12.7 The dynamometer inertia simulation must be set to the exact inertia value specified for the vehicle on the "Vehicle Specification Report."

12.8 The twin-roll hydrokinetic dynamometer loading must be set to the exact indicated horsepower.

12.9 The 48" single-roll electric dynamometer must be set to the correct inertia and A, B, and C coefficients.

12.10 The 48" single-roll electric dynamometer average positive simulation error must be less than 0.05% and the average negative simulation error must be greater than - 0.05%.

12.11 If the dynamometer has not been operated during the 2-hour period immediately preceding the test, it shall be warmed up for 15 minutes by operating at 30 mph using a non-test vehicle or as recommended by the dynamometer manufacturer.

12.12 The driver shall have turned the ignition key on and started cranking the engine for the hot start test between 9-11 minutes after the end of the sample period for the cold-start test.

12.17 Every range used for exhaust sample analysis must have span and zero verification checks.

The zero checks must be within ±2% of FS from the zero set-point that preceded the analysis.

The span checks must be within ±2% of FS from the span set-points that preceded the analysis.

12.18 Exhaust sample bags must be analyzed within 20 minutes of the end of the bag fill time for each phase of the test. Automatic bag timers monitor the elapsed time between completion of the sample collection and completion of the sample analysis and are reported on the Preliminary Laboratory Report.

13. Quality Provisions

13.1 The technician follows the sequence of steps on Form 730-01, recording data as needed.

13.2 The dynamometer inertia weight is verified by another technician other than the driver.

13.3 The twin-roll hydrokinetic dynamometer indicated horsepower is verified by another technician other than the driver.

13.4 The 48" single-roll electric dynamometer vehicle/dyno class, inertia, and A, B, and C coefficients are verified by another technician other than the driver.

13.5 The 48" dyno is made ready for testing by following the 48" single-roll electric dynamometer prep sequence.

13.6   The 48" single-roll electric dynamometer is self-checked during the warm-up.

13.7   If the automatic calibration procedure on the 48" single-roll electric dynamometer
        results in an update of the "OFFSET" or "SPAN" values, a new parasitic loss curve is
        run.

13.8   If the parasitic losses calibration procedure on the 48" single-roll electric
        dynamometer results in a change in parasitic loss at any speed point exceeding 1.0 lb,
        and, if the curve fit r^2 value is 0.996 or greater, the new losses curve is accepted.

13.9   The technician's identification number must appear on all forms and test records,
        certifying that the data are accurate and complete.

13.10   If the vehicle soak has exceeded the 3 hour limit since the completion of the FTP, it
        will be preconditioned by operation through one cycle of the UDDS prior to the start
        of the HFET. If the vehicle been moved outdoors, or to environments where the soak
        temperature is not controlled, it will be soaked at 68-86 °F for a minimum of 4 hours
        prior to performing the preconditioning UDDS.

13.11   Deviations from this procedure are documented on Form 902-01. In general, these
        deviations will void the data. However, the customer may choose to accept the data
        as variant. To do this, the customer must indicate acceptance by signing and dating
        Form 902-01.

Attachment A

Sample Collection and Exhaust Analysis

Vehicle ID#: _____   **Test Number:** _____

       FTP: _____   HFET: _____   IM240: _____ US06: _____

       Record last dyno usage time: _____

_____ Philco CVS test   _____   Horiba CVS
       Horiba test checks are not required   Philco test checks are not required

Horiba Test:

       _____ Verify CYSite bottle names match those posted on each Horiba system.

       _____ Verify the GPIB ="ON" and MEXA = "ONLINE"

       _____ All SHS filters OK.

       _____ Bags passed leak checked.

Philco Test:

       _____ Verify the following:

       *Dew-point meter is operating correctly and ambient temperatures are within tolerances.
       *CVS is in "Choke Flow" and that the sample flow rates are correct.
       *Analyzer bench filter has been changed.
       *Sample bags are purged and evacuated and the system has been checked for leaks.
       *Roll revolution counters are again set up to zer
       *Zero, span, sample flow rates are set correctly for each analyzer.

       _____ TAP program is activated. The correct test # and vehicle ID entered for each dyno.

Test Cell Setup:

_____ Noresco controller is in the "TEST" mode. Do not start test if light is flashing.

_____ VDA Test Information has been entered correctly.

_____ Dew-point meter is operating correctly and ambient temperatures are within tolerances.

_____ Horiba test activated in CDTCS. **Do not activate if test number not entered on VDA**

_____ Vehicle on dyno for HWFET. The remaining checks on this page were completed prior
       to the FTP. Go to verify fan operation and complete the remaining required portions of
       the form.

Twin-Roll Hydrokinetic Dynamometer Setup

_____ The correct IHp is selected and Inertia Weights are engaged.

_____ The roll selector switch is in "Rear Roll" position.

_____ The dyno brake is disengaged and vehicle is centered on dyno.
       Go to Test Vehicle Dynamometer Hookup

Page 1 of 2

Form 730-01: 10-10-2000

Attachment A Continued
Sample Collection and Exhaust Analysis

Vehicle ID#: _____   **Test Number:** _____

48" Single-Roll Electric Dynamometer Setup

_____ The roll brake is off, cradles are down and roll is not moving.

_____ The correct inertia and A, B, and C coefficients are entered on RTM-200 Computer.

_____ Dyno in "RUN MODE" and contact is engaged.

Test Vehicle Dynamometer Setup

_____ Vehicle restraint system is correctly connected.

_____ CVS is connected to vehicle. Check boots, gaskets, and connecting pipes for leaks.

_____ Vehicle hood is open and fan(s) positioned within 12 inches of vehicle.

Verify fan operation. Indicate fan placement:
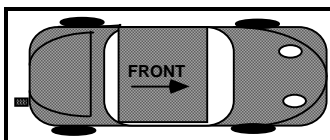
_____ Verify vehicle is in neutral, all accessories are off, and starting instructions are available.

_____ Tire pressure @ 45 psi or set @ _____ psi

Ten-Minute Soak

_____ Verify hood is down, fan and CVS blower are off during the 10-minute soak.

Review summary report - edit driving events - ensure that all TAP flags have been addressed.

Review CDTCS "Preliminary Laboratory Report" for any out-of-tolerance condition.

Signatures

I have performed all steps in accordance with the requirements of Test Procedures 707 and 708 and if applicable, 710.

Technician ID #: _____   Date: _____

The data entries are correct and meet the requirements of Test Procedures 707 and 708 and if applicable, 710.

Verified by: _____   Date: _____

Form 730-01: 10-10-2000

Attachment B
Horiba MEXA / CVS / CDTCS Shutdown and Start-up Sequences

If you suspect that the system is not communicating with CDTCS you may not need to do a total shut down. Keep the CDTCS Computer power on and shut down the equipment you are having trouble with. EXAMPLE: If the CVS is not communicating with the CDTCS you can shut this down and then power up. If the problem continues include Steps 8 through 11 of the shutdown process.

Shutdown Sequence: <u>Steps 8 through 11 are needed only for total power shutdown</u>

1. (Test Cell) - Turn off the CVS Main Power.

2. (Test Cell) - Turn off the MEXA 7200 Power Supply Unit - Main Power.

3. (Test Cell) - Turn off the LAN/HP-1B Gateway transciever by turning off the power strip.

4. (Control Room) - Select MEXA computer shutdown command.

5. (Control Room) - MEXA displays "LynxOS is down," turn off the Venturis FX computer

6. (Control Room) - Under "File" on the CDTCS computer select the shutdown command.

7. (Control Room) - When the blue Horiba Logo appears, shut off the Hewlett Packard computer.

8. (Control Room) - Turn off the external hardrive on top of the Hewlett Packard computer.

9. (Control Room) - MicroSoft NT computer software shutdown.

10. (Control Room) - MicroSoft NT computer power off.

11. (Control Room) - EPA Hub.

Startup Sequence: <u>Steps 1 and 2 are needed only if a total power shutdown was performed.</u>

1. (Control Room) - Turn on the EPA Hub (only if shut off in total shutdown).

2. (Control Room) - Turn on the MicroSoft NT Host (only if shut off in total shutdown).

3. (Test Cell) - Turn the LAN/HP-1B Gateway transciever on by turning the power strip on.
   Verify that the LAN and HP-1B yellow lights are illuinated.

4. (Test Cell) - Turn on the MEXA 7200 Power Supply Unit - Main Power.

5. (Test Cell) - Verify that the IFC - OPE light is at a single rhythmic blinking pace before
   proceeding similar to that OPE light on the SVS unit.

6. (Test Cell) - If OPE light is at a single rhythmic blinking pace, turn on the CVS Main Power.

7. (Control Room) - Turn on the MEXA Venturis FX Computer. Wait all analyzers to appear.

8. (Control Room) - In the upper right corner select of the MEXA screen, select "STANDBY".

9. (Control Room) - Turn on the external hardrive on top of the Hewlett Packard computer.

10. (Control Room) - Turn on the CDTCS Hewlett Packard computer.

11. (Control Room) - When the blue Horiba logo appears, enter "dyno" as the user and push enter.

12. (Control Room) - Click on enter again. No password is needed.

13. (Control Room) - When the "Starting Trace Manager" appears window, the start-up is completed.

14. (Test Cell) - On the LAN/HP-1B Gateway, verify that all of the yellow lights are flashing. If
    they are not, you will not be able to run any tests. Identify the problem and repeat
    the shutdown and startup sequences.

Attachment C

CYSITE Report

Attachment C Continued

Horiba MEXA Analyzers Span Point Change

After anytime a span bottle is replaced, a new concentration for that bottle must be recognized. To do this you must be in the "Supervisor" mode.

1. Under the Horiba logo, select "SUPERVISOR". Type in the password.

2. If not in the "Utility" mode, select "Utility" under the "Menu" button.

3. Click on the "Check / Tests" button and select "Linearize"

4. When the "Analyzer Linerization" panel appears, click on "Individual"

5. Select the "Component" (gas) and the "Range" of the bottle you are naming.

6. Click on the "Span Bottle Naming" button and the "Span Bottle Naming" panel will appear.

7. Enter the bottle named concentration by clicking on the yellow numbers displayed in the "Span gas conc." field.

8. Press the "Read Counts" button. When completed the "Span Bottle Naming" panel will appear.

9. If the measure concentration is within 1.0 percent of the bottle concentration, click on the "OK" button. To exit without saving the changes, click on the "Cancel" button.

Alternative to changing Bottle Concentration.

1. Press the button for the desired analyzer (CO,CO2,HC,NOx, or Methane) in the display area of the basic panel.

2. Select the "Set span" option from the pop-up menu.

3. The values for ranges and spans are displayed. Edit any value that is displayed in yellow by clicking on the number and using the keypad, enter the bottle concentration.

4. Click on the "OK" button to save changes and close the panel. To exit without saving the changes, click on the "Cancel" button.

Attachment D

Horiba CVS Filter Change

SHS Filters

Oil catcher

Check to see that the oil catcher filter is installed properly.

Make sure the filter has the correct orientation.

For EGR sample lines, the orientation of the oil catcher filter is opposite of the picture above. To replace the oil catcher filter, set a valve at the oil catcher side to 'close'.

Dust filter

Check to see that the cylindrical dust filter is installed properly.   The cap should be fastened tightly so that the O-ring seal is visible.   If the O-ring is not installed properly, NOx, THC and O2 leaks may occur.   On the sample filter, Horiba logo is printed.   Turn the filter so that you can see the logo through the cap.   Replace the filter when the Horiba logo is no longer visible.
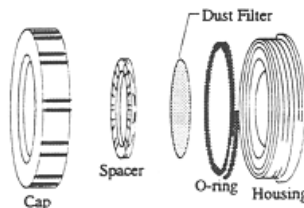
Note: The leakage from the filter unit affects the indication. Tighten the filter firmly.

Drain pump preservation filter

Check that the drain pump preservation filter is in place.   Replace the filter when you can detect excess moisture in the oil catcher.
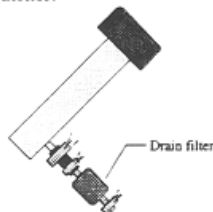
Air filter

Check that the air filter element is in place.   Replace if dirty.
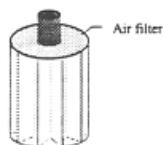
When using shop air, check the air filter and mist separator filter.   Drain accumulated moisture and replace when needed.

MEXA START-UP and SHUT DOWN 27

Attachment E

Video Drivers Aid Operation

1.0   VDA System: To operate the VDA, you may need to view MacAcademy's "Basic Macintosh" videotape, which is a self-taught course explaining the operation of the Macintosh personal computer. The following is a brief summary of techniques needed to use the mouse.

    1.1   To operate the Mouse: Move the mouse around on a flat surface to position the pointer on the VDA screen. When you move the mouse, the pointer on the screen moves correspondingly.

    1.2   To Click**:** Position the pointer on what you want to select or make active. Press and quickly release the mouse button.

    1.3   To Double Click**:** Position the pointer on your selection. Press and release the mouse button twice in quick succession.

    1.4   To Press**:** Position the pointer on a menu title. Without moving the mouse, press and hold the mouse button.

    1.5   To Drag: Position the pointer on your selection. Press and hold down the mouse button and move the mouse to the new destination. Release the mouse button.

    1.6   To Add Comments**:** Press <∼>. This will flag the data for entry of a comment at a time convenient for the driver.

2.0   To start the VDA, enter the test cell and turn the video monitor power switch "ON." The control dialog box will appear at the bottom of the VDA screen, see below.


```
┌─────────────────────────────────────────────────────────────────────┐
│ ┌──┐  00:00   ◯ Ready  ◯ Bag 1  ◯ Bag 2  ◯ Soak  ◯ Bag 3  ◯ EOT      │
│ │▤ │  [ ⌘S - Start scrolling ]  [⌘ sp - Hold cranking (>10s)]  [ ⌘K - kill ] │
│ └──┘                                                                   │
└─────────────────────────────────────────────────────────────────────┘
```
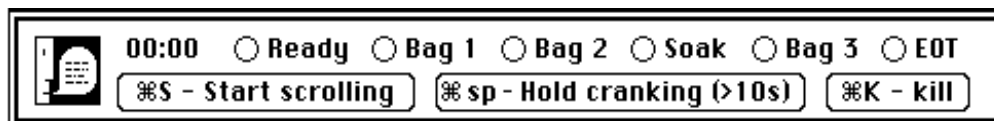
Control dialog box

Attachment E Continued

3.0 The following is a list of the computer keyboard commands that are accessed by simultainously using the command key with another key. The computer operations performed are listed below each combination.

The symbol for the command key is ⌘

⌘ S	⌘ Space Bar	⌘ K
Start cranking	**Hold cranking**	**Kill**
Start scrolling	**Hold scrolling**	
Try again		

4.0 Return to the control room and turn the hard disk computer drive (lower unit) power switch on, wait 15 seconds, then turn the Macintosh Computer power switch on. The computer will beep and an icon representing a floppy disk will appear on the screen. See Figure 1.
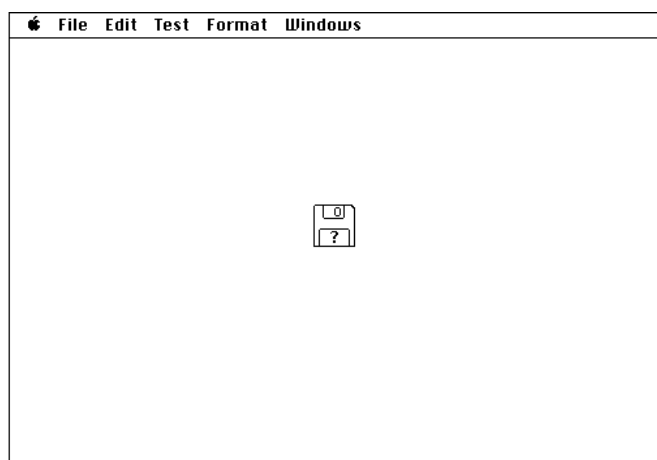
Figure 1

5.0 The message "Connect to the file server "LNS Production Server" as: Registered User" will appear. See Figure 2. The dyno number will be displayed in the "Name" box. Type in the correct password and select the "OK" button.
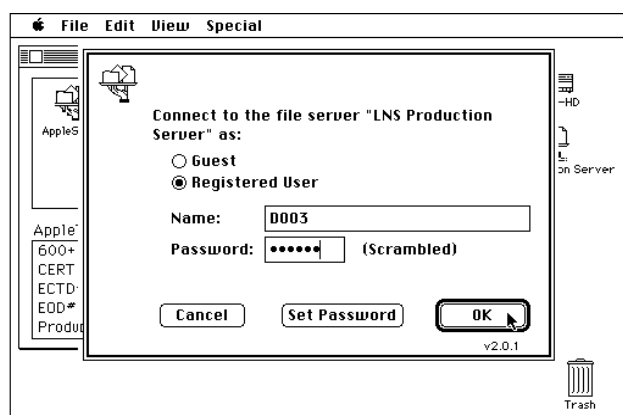
Figure 2

Attachment E Continued

6.0   The clock synchronization program will automatically run and set the clock.

7.0   The "LNS Production Server" icon will appear. Position the mouse pointer on the icon and double click to open it. See Figure 3.
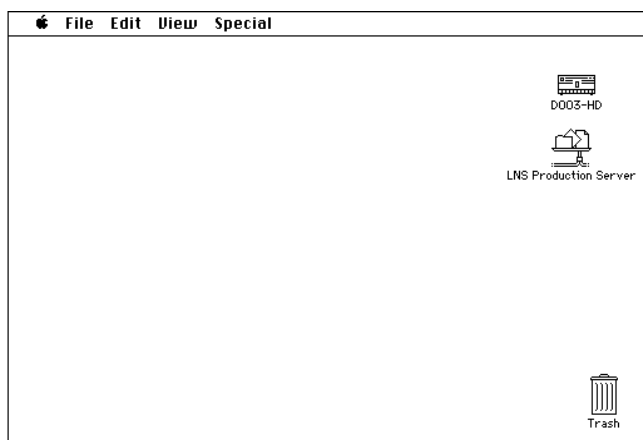
Figure 3

8.0   Position the mouse pointer on the "VDA" folder and double click to open it. See Figure 4.
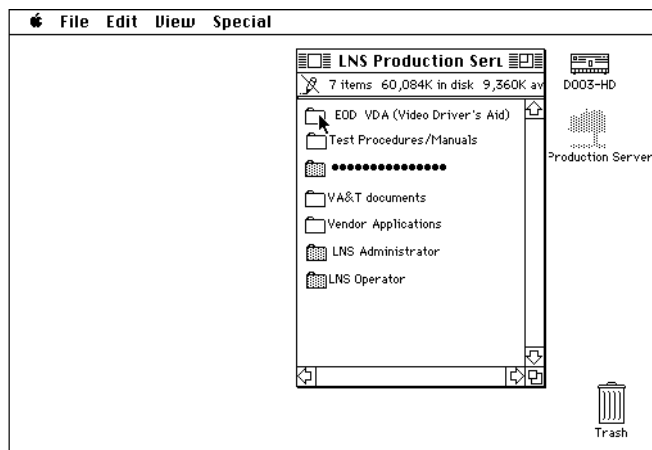
Figure 4

9.0   If an incorrect folder is selected, position the mouse pointer on the correct folder and select it. If an incorrect folder is opened, position the mouse pointer on the "Close" box in the upper left corner of the window and click to close it. Position the mouse pointer on the correct folder and double click on it.

Attachment E Continued

10.0   Preps:

     10.1   Position the mouse pointer on the "2-PREPS to be done" folder and double click to open it. See Figure 5.
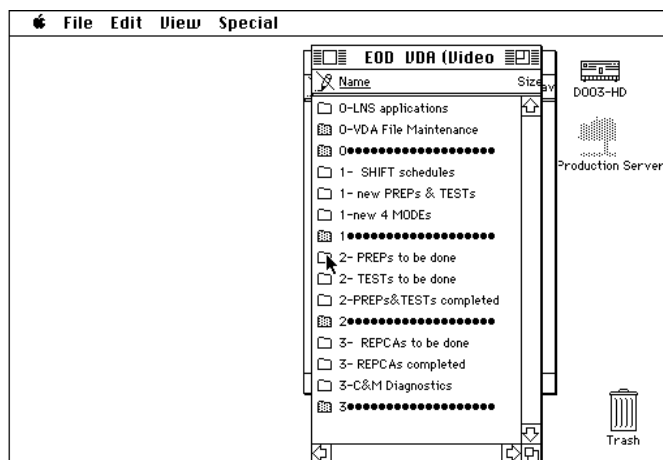
Figure 5

     10.2   Position the mouse pointer on the "Preps" folder for the applicable day of the week and double click to open it (this example is for Monday). See Figure 6.
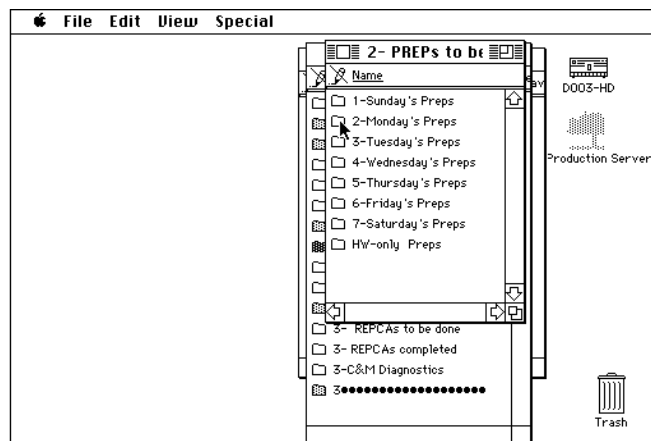
Figure 6

Attachment E Continued

10.3   Position the mouse pointer on the appropriate test number and double click to open it. See Figure 7. If the test number cannot be located, contact the VT senior technician.
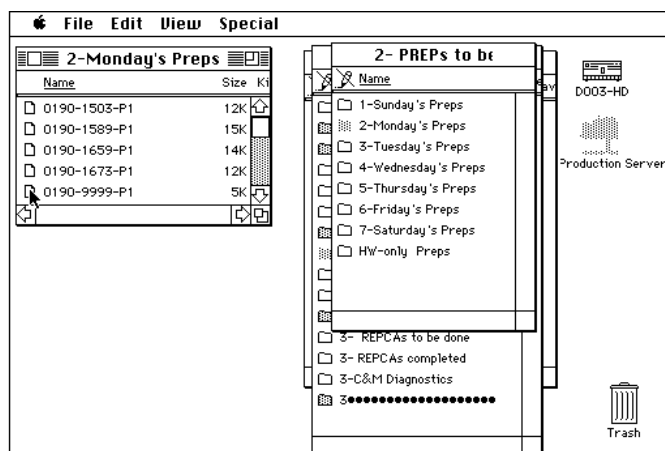
Figure 7

11.0   For FTP Tests:

11.1   Position the mouse pointer on the "2-TESTs to be done" folder and double click to open it. See Figure 8.
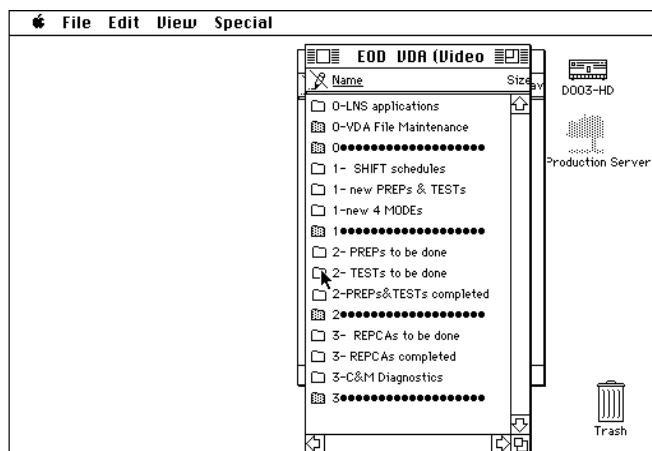
Figure 8

Attachment E Continued

11.2   Position the mouse pointer on the tests folder for the applicable day of the
         week and double click to open it (this example is for Tuesday).
         See Figure 9.
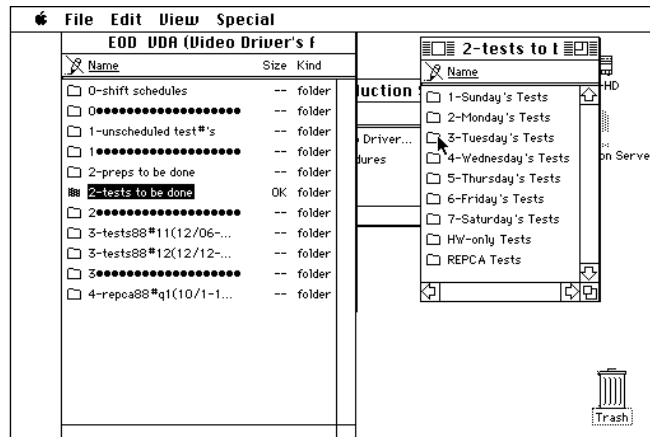
Figure 9

11.3   Position the mouse pointer in daily tests window on the appropriate test
         number and double click to open it . See Figure 10. If the test number
         cannot be located, notify the VT senior technician.
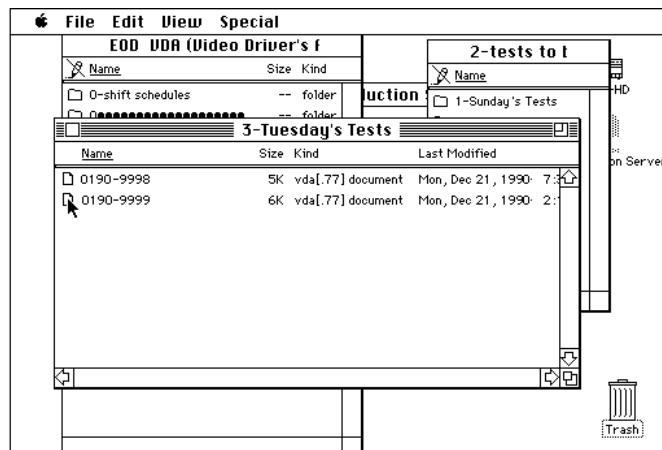
Figure 10

Attachment E Continued

12.0   For Highway Tests:

12.1   Position the mouse pointer on the "2-TESTs to be done" folder and double
click to open it. See Figure 11.
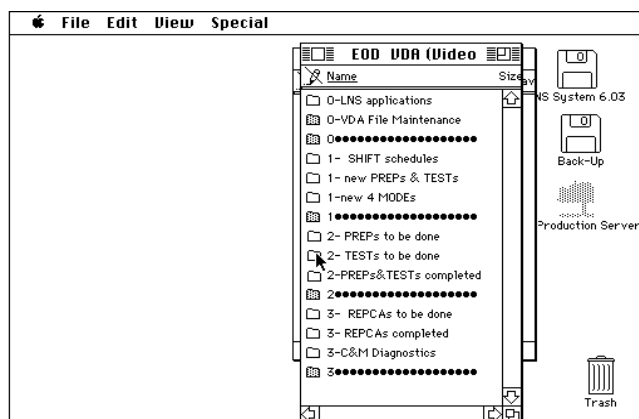
Figure 11

12.2   Position the mouse pointer on the tests folder for the applicable day of the
week and double click to open it (the following example is for HW-only
Tests). See Figure 12.
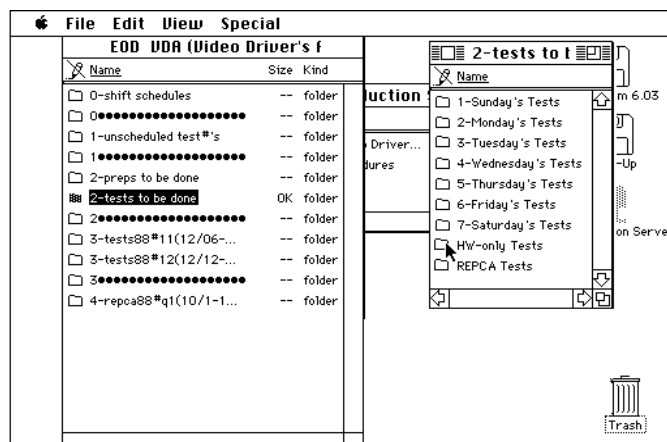
Figure 12

Attachment E Continued

12.4   Position the mouse pointer in the daily tests window on the appropriate test
         number and double click to open it. See Figure 13. If the test number
         cannot be located, notify the VT senior technician.
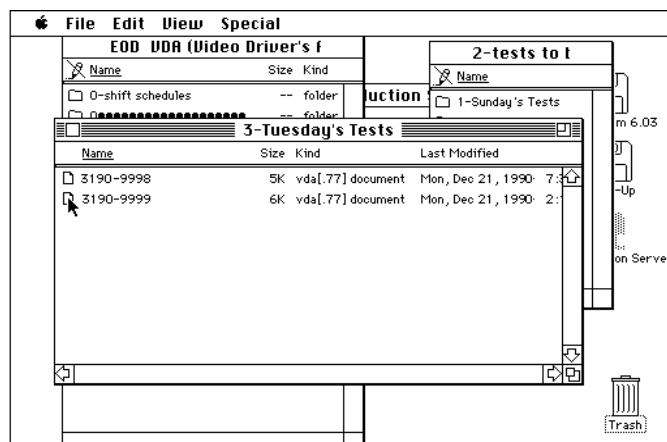
Figure 13

13.0   The notice "Please wait while test # is being expanded" will momentarily appear on
        the VDA screen.

14.0   If the warning "Dyno interface device is off, inoperative, or missing" appears on the
        screen, contact the Computer Room for assistance. See Figure 14.
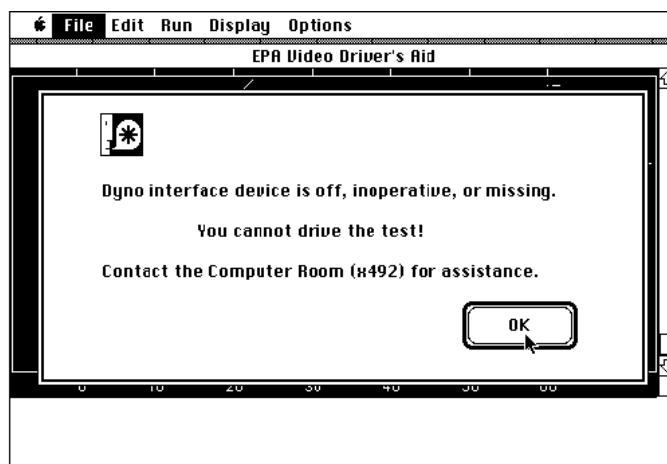
Figure 14

Attachment E Continued

15.0   Check the information in the "Vehicle Information Dialog Box" against the VSR.
See Figure 15. If the data are not correct, contact the VT scheduler.

If the test data are correct, enter the following in the appropriate boxes:

"Equivalent Test Weight"

"Indicated Dyno HP" for twin-roll hydrokinetic dyno, or the letters "COEF" for
48" single-roll electric dyno

"Driver's ID"

"Dyno Site"

Figure 15

16.0   Position the mouse pointer on the "OK" button and click on it.

When the VDA program is activated and the correct data have been entered, place a
checkmark in the proper space on Form 707-01.

Attachment F

Specific Humidity Specification Range
for Fuel Economy Test
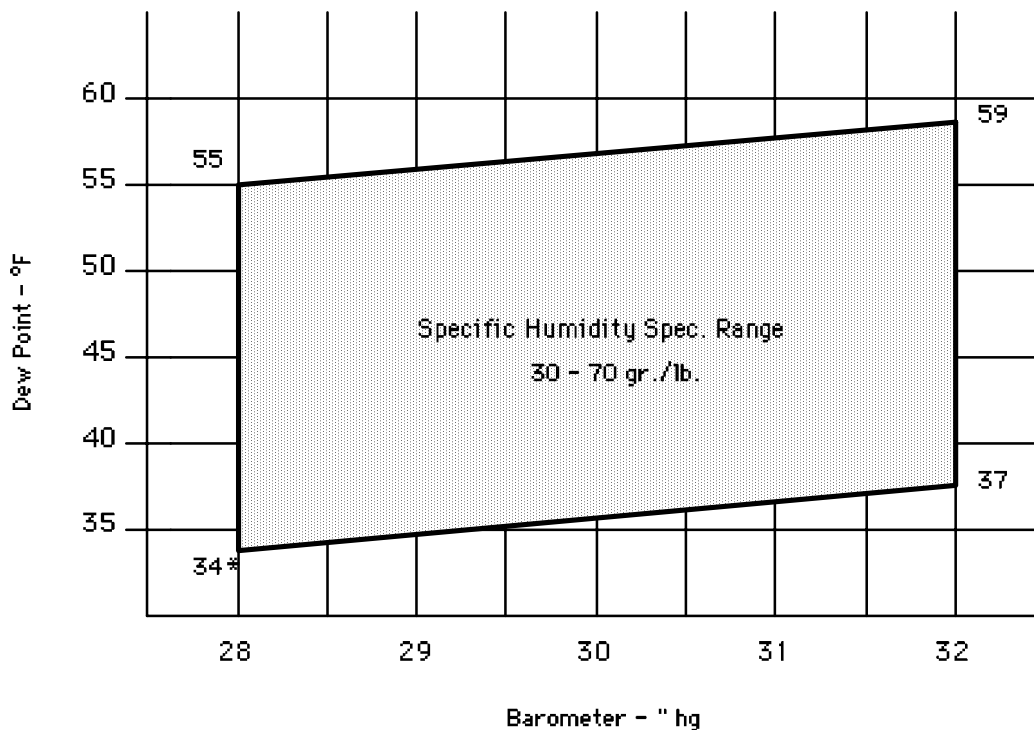
•The endpoints for the dew point are listed on the corners of the spec. range. *If you obtain a reading of 34°F or less on the dew-point hygrometer contact C&M immediately.

•The boundaries for this graph are   **not** exact. If you are not certain that a test was performed w/in the specific humidity spec. range contact a senior technician or calculate the exact specific humidity by running the Excel file "Humidity Calc. 3.0" in the VTG Misc. folder on the Vehicle Testing Computer in Room 323E.

Attachment G

Single-Roll Dyno Warmup Flow Chart

Start

Dyno used in last 2 hours? — No → Run Warmup

Dyno used in last 2 hours? — Yes

Run Warmup → Dyno warm after 5.5 minutes?

Dyno warm after 5.5 minutes? — Yes → Record last dyno usage time on Form 707-01

Dyno warm after 5.5 minutes? — No → Stop the Prep Contact C&M

Record last dyno usage time on Form 707-01 → Is this the first test of the day?

Is this the first test of the day? — No

Is this the first test of the day? — Yes → Run Automatic Calibration procedure

Run Automatic Calibration procedure → Change: Offset > 0.5 lb Shunt > 2 lb

Change: Offset > 0.5 lb Shunt > 2 lb — Yes → Accept New Values

Change: Offset > 0.5 lb Shunt > 2 lb — No

Accept New Values → Print Automatic Calibration Report → Run Automatic Calibration Procedure Again

Run Automatic Calibration Procedure Again → Change: Offset > 0.5 lb Shunt > 2 lb

Change: Offset > 0.5 lb Shunt > 2 lb — Yes

Change: Offset > 0.5 lb Shunt > 2 lb — No → Were Values Updated?

Stop the Prep Contact C&M

Were Values Updated? — No → Prep Complete

Were Values Updated? — Yes → Print Automatic Calibration Report

Print Automatic Calibration Report → Run Parasitic Loss Test

Prep Complete

Were Values Updated? — No → Prep Complete

Were Values Updated? — Yes → Accept New Values

Run Parasitic Loss Test → CURVE FIT < 0.996?

CURVE FIT < 0.996? — Yes → Run Parasitic Loss Test Again

CURVE FIT < 0.996? — No → Does Change Exceed 1 lb?

Run Parasitic Loss Test Again → CURVE FIT < 0.996?

CURVE FIT < 0.996? — No

CURVE FIT < 0.996? — Yes

Does Change Exceed 1 lb? — Yes → Accept New Values

Does Change Exceed 1 lb? — No

Accept New Values → Print Parasitic Losses Report

Print Parasitic Losses Report

Attachment H

Horiba Electric Dynamometer Automatic Calibration Report

```
                    HORIBA ELECTRIC DYNAMOMETER
                              CDC-900
                    AUTOMATIC CALIBRATION REPORT

  TEST SITE:   DOO5                         END DATE:   Mar 29 1995
  ARCHIVE REC: 9999                         END TIME:   20:39:20

  LOSSES REC:  228

  COMMENT:

  DIRECTION:   FORWARD

  OFFSET READING SPEED:  5.00 MPH

              PREVIOUS                 MEASURED                CHANGE
              --------                 --------                --------
  OFFSET:      -0.75 LBS                -1.00 LBS               -0.25 LBS

  +SHUNT:      1753.0 LBS               1753.1 LBS                 0.1 LBS
  +SPAN :      0.2380                   0.2380                  -0.0000

  -SHUNT:     -1755.0 LBS              -1754.9 LBS                 0.1 LBS
  -SPAN :      0.2382                   0.2382 LBS              0.0000
```

Attachment H Continued

```
                   HORIBA ELECTRIC DYNAMOMETER
                            CDC-900
                   PARASITIC LOSSES REPORT

   TEST SITE:   DOO5                          END DATE:   Mar 29 1995
   ARCHIVE REC: 999                           END TIME:   20:39:20

   PREV LOSS REC: 228

   COMMENT:

   DIRECTION:  FORWARD
                    SPEED          LOSSES          CHANGE
                    MPH            LBS             LBS

                   ---------      ----------      ----------
                       5             0.1            -0.1
                      10             0.3            -0.3
                      15             0.4            -0.6
                      20             0.5            -0.7
                      25             1.0            -0.4
                      30             0.8            -0.6
                      35             1.1            -0.4
                      40             1.6            -0.1
                      45             1.7            -0.2
                      50             2.0            -0.1
                      55             2.5            -0.1
                      60             3.2             0.0


   PARASITIC LOSS CURVE FIT r-SQRD: 0.986

   LOSS CURVE COEFFICIENTS:
                          a:  -0.87     LBS
                          b:   0.047    LBS/MPH
                          c:  -0.000016 LB/MPH2
                          d:   0.000016 LB/MPH3

   MAX BEARING MOTOR SPEED: 100.000 MPH
   BEARING LOSSES OFFSET: 0.000 LBS
```

Attachment H Continued

```
                      HORIBA ELECTRIC DYNAMOMETER
                               CDC-900
                         DYNAMOMETER REPORT

     TEST SITE:    DOO5                       END DATE:    Mar 29 1995
     ARCHIVE REC:  9999                       END TIME:    20:39:20
     TEST NUMBER:  95 9999                    TIME STARTED:  20:14:20
     VIN:
     OPERATOR:     42044


     COMMENT:


     DIRECTION:   FORWARD
     AUGMENTED BRAKING: OFF
     GRADE:  OFF


     INERTIA:   3625  LBS


     ROAD LOAD: 8.60  HP@50
             A:    3.87  LBS
             B:  -0.0028  LB/MPH
             C:  0.02430  LB/MPH2


     DISTANCE TRAVELED:               3.920  MILES


     ENERGY TRANSFERRED FROM VEHICLE:   3722.3  HP-S
     ENERGY TRANSFERRED TO VEHICLE:     2130.8  HP-S


     AVERAGE   POSITIVE ERROR:    0.02 %
     AVERAGE   NEGATIVE ERROR:   -0.02 %

                  F O R C E   E R R O R   S T A T I S T I C S


     SPEED RANGE    NUM        MINIMUM      MAXIMUM      AVERAGE    STD DEV
        MPH         PTS        LBS          LBS          LBS        LBS

     ----------     ---       -------      -------      -------    --------
       5.-.15       24        -3.960        2.463       -0.947      1.633
      15.-.25       156       -7.429        3.106        0.013      1.316
      25.-.35       132       -3.725        5.102        0.063      0.990
      35.-.45       18        -1.813        3.891        0.142      1.460
      45.-.55       83        -1.250        1.243       -0.075      0.533
      55.-.65       34        -0.734        0.646        0.112      0.290
      65.-.75        0         0.000        0.000        0.000      0.000
      75.-.MAX       0         0.000        0.000        0.000      0.999

     PARASITIC LOSSES RECORD:  217
     LOSS CURVE COEFFICIENTS:
                     a:     -0.249    LBS
                     b:      0.020    LB/MPH
                     c:     0.000478 LB/MPH2
                     d:     0.000001 LB/MPH3
```

Attachment I

Answer File Data Transfer to CDTCS

On the WindowsNT computer screen, double-click the icon "Sch To Sites_Today."
See the arrow in Figure 1.
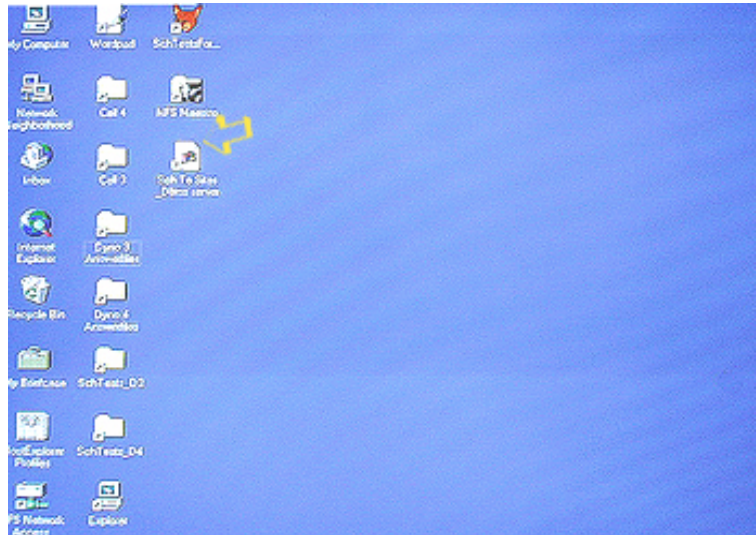
Figure 1

If a request appears on the screen to Enter User Name and Password, enter the required
information..

On the "//(Dbms) server/sch to sites" screen, find and highlight the scheduled test(s) for
D00X, where X is the dyno number. See Figure 2.
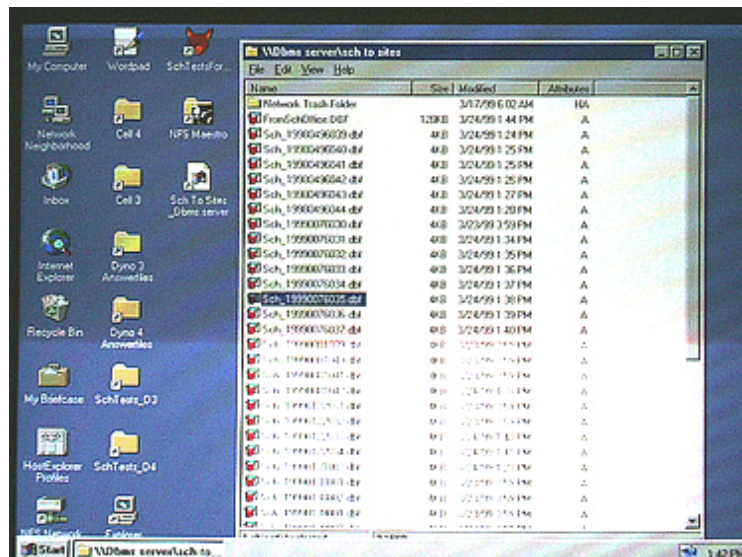
Figure 2

Note: If you need earlier scheduled test(s) , double-click on "Sch to Sites_Earlier" and find and
highlight the scheduled test(s).

Attachment I Continued

Drag the highlighted scheduled test(s) to the icon "SchTests_DX", where X is the dyno number. See the arrows in Figure 3.
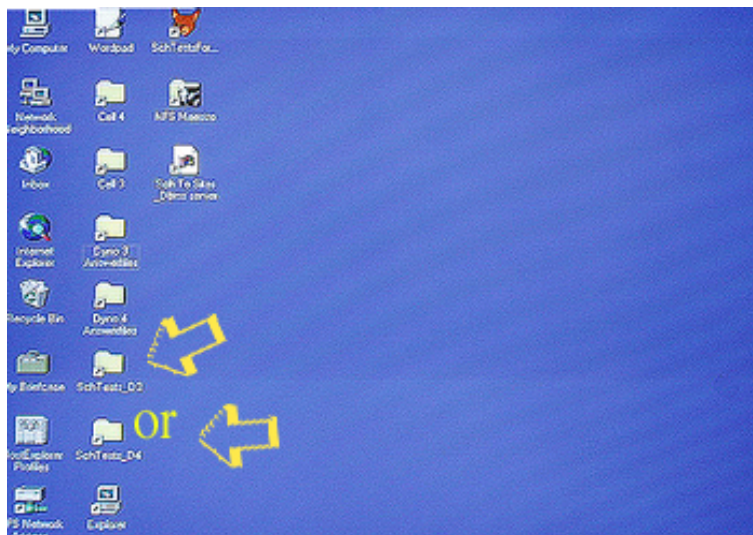
Figure 3

Close "Sch To Sites_Today", or "Sch To Sites_Earlier" panel.

Double-click on the Fox icon "SchTestsFor..." See the arrow in Figure 4.
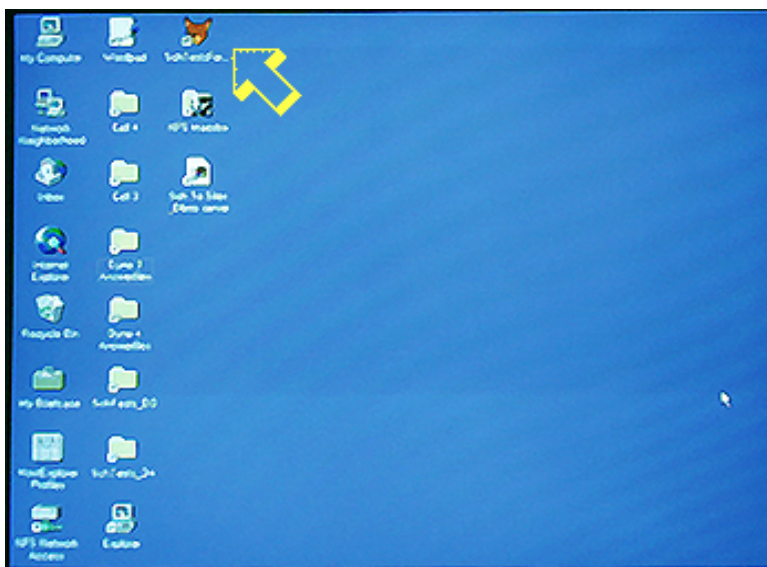
Figure 4

Attachment I Continued

Set the Flow Rate at 350, unless otherwise specified at 500 or 850. See Figure 5.
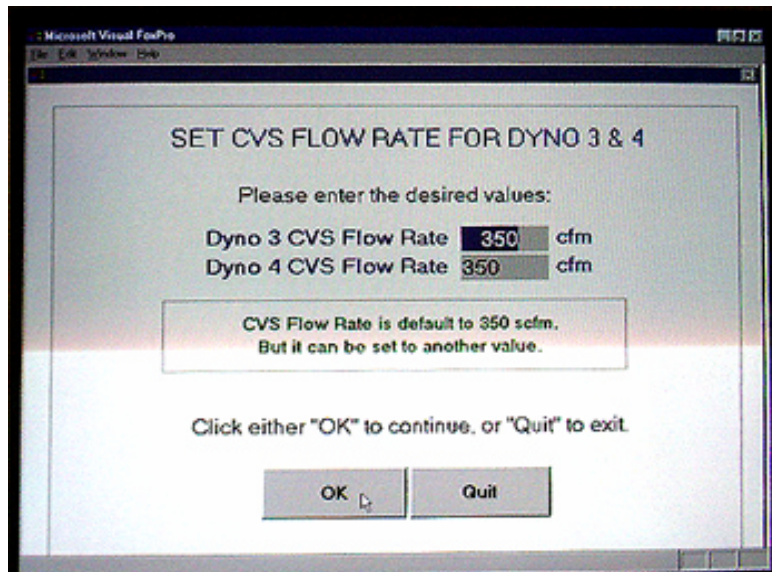
Figure 5

Press the "OK" button. Wait for a few seconds for the files to complete translation.

Double-click on "Dyno3 Answerfiles" (or Dyno4) to verify the files have been transferred. See the arrows in Figure 6.
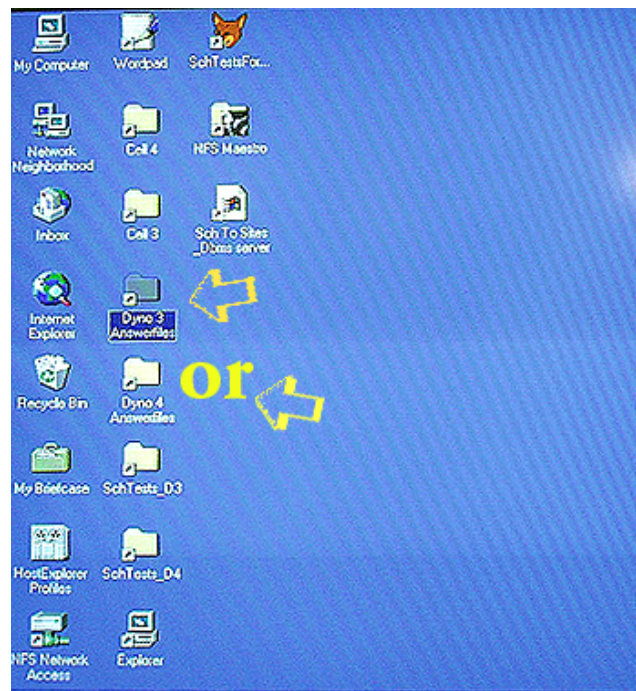
Figure 6

Attachment I Continued

Pull down the "View" menu and click on the "Refresh" button. See the arrow in Figure 7.
Verify that all test numbers are displayed in the window.
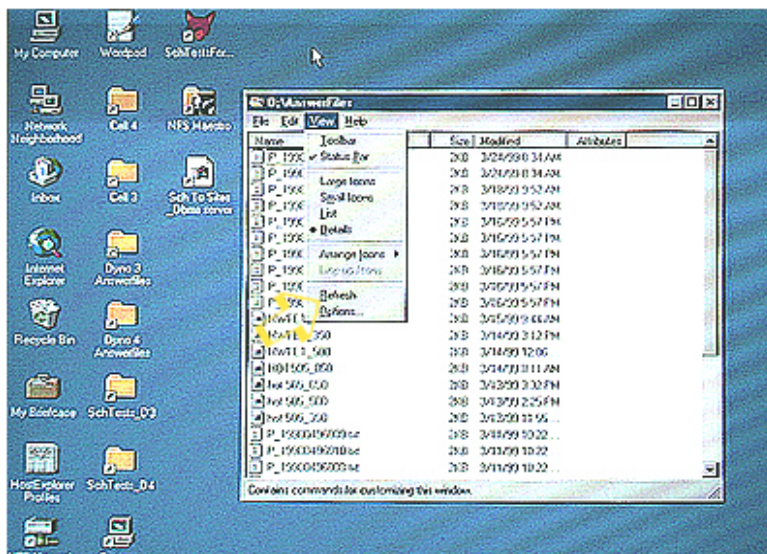
Figure 7

Close "Dyno3 Answerfiles" (or Dyno4) window.

Attachment J
UDDS Specifications

The operator will follow the driving schedule trace as closely as possible, using the minimum accelerator pedal movement necessary to maintain the required speed, and he/she may use the choke, accelerator pedal, etc., where necessary to keep the engine running.

Accelerations shall be driven smoothly and deceleration modes shall be run in gear using the brakes or accelerator pedal as necessary to maintain the desired speed. The upper speed tolerance at any given time for the UDDS is 2 mph higher than the highest point on the trace within 1 second of the given time. The lower speed tolerance at any given time for the UDDS is 2 mph lower than the lowest point on the trace within 1 second of the given time. Speed variations greater than the tolerances (such as may occur during gear changes) are acceptable provided they are less than 2 seconds in duration. Acceptable speed variations may occur during gear changes, brake spikes, engine stumbling, etc. Speeds lower than those prescribed are acceptable provided the vehicle is operated at maximum available power (MAP) during such occurrences.

If a vehicle fails to achieve the required acceleration rate under wide open throttle (WOT) during the UDDS, the test will be completed and the senior technician and a Certification Division (CD) Representative or EPA Task Officer will be notified. The CD representative or EPA Task Officer will then determine the acceptability of the shift schedule.

If the vehicle has an automatic transmission, idle modes shall be run with the automatic transmission in drive and the brakes applied.

If the vehicle has a manual transmission, shift the gears at the points specified on the driving schedule. In cases where the manufacturer recommends special shift points or use of a shift indicator light, an appropriate VDA driving schedule will be provided with the special shift points indicated. The operator shall release the accelerator pedal during each shift and accomplish the shift in the minimum necessary time. For those modes which decelerate to zero, manual transmission clutches shall be depressed when the speed drops below 15 mph, when engine roughness is evident, when engine stalling is imminent, or where noted on special shift schedules. Optional downshifts (the 187-second point and 840-second point on the driver's trace) are made only at the manufacturer's request or to prevent lugging or stalling. Idle modes shall be run with the transmission in gear and the clutch disengaged, except for the first idle.

If the engine stalls during an idle period (other than initial idle), the engine shall be restarted immediately and the test continued. If the engine cannot be restarted before the next acceleration, immediately stop the VDA trace by pressing <Command-Space Bar> and restart the engine. If the engine starts, accelerate the vehicle to required point on the VDA trace and immediately restart scrolling of the VDA trace by pressing <Command-S>.

If the engine stalls during some operating mode other than idle, immediately stop the VDA trace scrolling by pressing <Command-Space Bar> (it is not necessary to bring the drive wheels to a stop). The vehicle shall then be restarted and accelerated to the speed required at that point in the driving schedule. During acceleration to this point, shifting shall be performed in accordance with CFR 86.128. When the vehicle reaches the required point on the VDA trace, immediately restart scrolling of the VDA trace by pressing <Command-S>. If the vehicle does not restart immediately, attempt to restart the vehicle, cranking for 10 seconds and pausing for 10 seconds, for up to 1 minute. If the vehicle will not restart within 1 minute, notify the senior technician. Make no further attempts to restart the vehicle. The test shall be void, the vehicle removed from the dynamometer. Complete Form 902-01, obtain all approval signatures, and file with the data processor.

Attachment K

Highway Fuel Economy Test

The following steps are for the HFET. Start the test vehicle's engine according to the manufacturer's recommended starting procedures. If the test vehicle is in the Recall program, start the engine according to the technical directive. Follow the instructions in the control dialogue box at the bottom of the screen.

If the vehicle engine starts and continues to run, start the VDA trace scrolling by pressing <Command-S>, following the instructions at the bottom of the screen.

If you need to stop, select the "Kill" button by pressing <Command-K>. To resume the procedure, position the mouse pointer on "Test." Press and hold down the mouse button and pull down the "Test" Menu. Position the pointer on the "Rewind" menu item and release the mouse button to select it.

To start scrolling, simultaneously press <Command-S> and crank the engine. The crank time will be displayed on the left side of the control dialog box. See Figure 1.
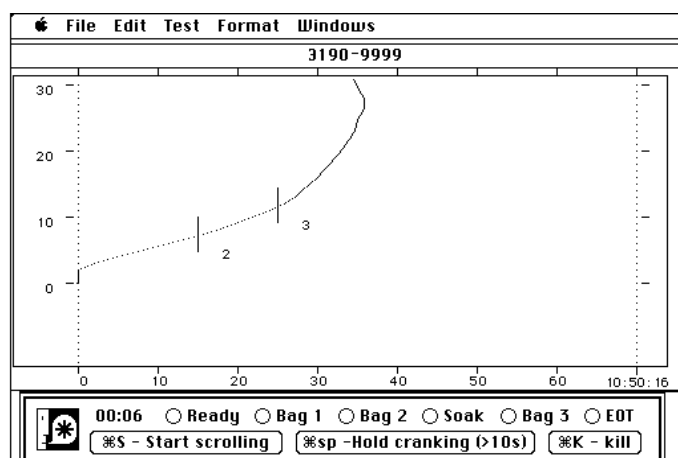
Figure 1

If the key has not been turned to the start position and you need to stop, select the "Kill" button by pressing <Command-K>. To resume the procedure, position the mouse pointer on "Test." Press and hold down the mouse button and pull down the "Test" Menu. Position the pointer on the "Rewind" menu item and release the mouse button to select it .

If the vehicle does not start after 10 seconds of cranking, the cranking shall cease and the reason for failure to start shall be determined. Select the "Hold cranking > 10 sec." button at the bottom of the screen by pressing <Command-Space Bar>.

Attachment K Continued

Second start attempt, see Step 406 in the test procedure.

Start the test vehicle's engine according to the manufacturer's recommended starting procedures.
If the test vehicle is in the Recall program, start the engine according to the technical directive.
Follow the instructions in the control dialogue box at the bottom of the screen. To start scrolling,
simultaneously press <Command-S> and crank the engine.

If the engine false starts, see Step 409 in the test procedure.

Operate the test vehicle for one preconditioning EPA Highway Fuel Economy Driving Schedule
(HFEDS). See TP 703 for driving techniques to be followed during the vehicle preconditioning.

Before driving the test vehicle on the 48" single-roll electric dynamometer, ensure that it is in the
"RUN MODE" and the contact has been engaged.

If at any time during the driving of the HFEDS a condition occurs that requires the driver to add a
comment, press <~>. This will flag the data for entry of a comment at a time convenient for the
driver.

If the vehicle is driven at wide open throttle (WOT), indicate all places where this occurs on the
VDA trace. See Section 600, Editing Driving Events for instructions.

At the 780-second point of the HFET, 2 seconds before the beginning of the first acceleration,
the VDA will automatically start sampling Operate the test vehicle for one EPA Highway Fuel
Economy Driving Schedule (HFEDS).

If the vehicle stalls during the sample collection of the HFEDS, the test is void.

If problems occur before the end of the test (1545 seconds), the HFEDS may be stopped by
selecting <Command-Space Bar> and corrective action taken. The sample bags must be
evacuated, purged, and evacuated again and the roll revolution counter must be reset.

If the test is to be set up again prior to the 780 second point of the trace, and the CVS has not
been sampling, purging and evacuating are not required. For both conditions the TAP test file
must be saved as "Bad" and the test number entered again.

The previous test data have not been saved and the HFEDS may then be restarted. To restart the
VDA video strip chart at the beginning, position the pointer on the "Re-set up Test" button in the
control dialog box and click on it.

If the engine is running, do not attempt to start it again. The final VDA Summary Report will
show that the test had been set up again, thus documenting the corrective action taken.

The test number may be reused. The bags must be evacuated, purged, and evacuated again
unless another set of bags is used.

TP 730B   **Attachment K Continued**

At the 1545-second point of the HFEDS, 2 seconds after the end of the deceleration to zero, the VDA will automatically switch off the sample bag. See Figure 22. The "EOT" indicator will come on. The vehicle engine must be running.

Within 1 minute following completion of the HFEDS, the driver must perform a Quick Check Coastdown, if required (TP 712). When the Quick Check Coastdown is completed, turn off the CVS blower.

Go to Section 400 for vehicle removal from the twin-roll dyno or go to Section 500 for details on vehicle removal from the electric dyno.

These criteria must be met for the HFET to be valid:

Ambient temperatures encountered by the test vehicle must remain within 68-86 °F at all times.

The sample VDA trace must be within the following HFEDS speed tolerances:

The upper limit speed tolerance for the HFEDS preconditioning cycle trace is 4 mph higher than the highest point on the trace within 1 second of the given time. The lower limit is 4 mph lower than the lowest point on the trace within 1 second of the given time (per EPCN 33).

The upper limit for the HFEDS cycle trace is 2 mph higher than the highest point on the trace within 1 second of the given time. The lower limit is 2 mph lower than the lowest point on the trace within 1 second of the given time.

Speed variations greater than the tolerances (such as may occur during gear changes, etc.) are acceptable provided they occur for less than 2 seconds on any occasion.

Acceptable speed variations may occur during gear changes, brake spikes, engine stumbling, etc.

Speeds lower than those prescribed are acceptable provided the vehicle is operated at maximum available power during such occurrences.

The dynamometer inertia simulation must be set to the exact inertia value specified for the vehicle on the "Vehicle Specification Report."

The twin-roll hydrokinetic dynamometer loading must be set to the exact indicated horsepower.

The 48" single-roll electric dynamometer must be set to the correct inertia and A, B, and C coefficients.

The 48" single-roll electric dynamometer average positive simulation error must be less than 0.05% and the average negative simulation error must be less than -0.05%.

The dynamometer must be warmed according to CFR 86.135.

Attachment L

HFET Video Drivers Aid Report

```
********************************************************************************
*  VIDEO DRIVER'S AID TEST REPORT (1.22b3)                   Page  1 of  3  *
*  0195^0000                                     Processed: 08:13:50 01/30/95  *
********************************************************************************


     -- Test and Vehicle Information --
Test Sch:  0195^0000                    Mfr:
Shift Sch: A260-0069                    Veh ID:
Drive Sch: HWFE(Cert)                   Version:      02
Test Type: 01                           Eq Test Wgt:3500
Test Proc: 03                           Ind HP:      6.3
Driver ID: 42131                        Dyno Site:   D001
Key Start: 09:21:47 12/30/94


     -- Test Control Events --
          clock              event
 trace    time     test      time     CVS
 time     stamp   control   seconds   status
------- -------- --------- ------- ---------
    .0             SETUP
    .0 09:21:38 CVSWAIT1      4.4 EOT
    .0 09:21:43 READY         4.4 RDY
    .0 09:21:47 STARTUP        .7 RDY
    .0 09:21:48 DRIVE       780.0 RDY
 780.0 09:34:48 DRIVE       765.0 BAG 1
1545.0 09:47:33 FINISHED       .1 EOT


                                         -- Out of Tolerance Data --
   -- Comments --                          last    back            max
  trace                                   in tol  in tol  secs     mph
  time     comments                       @trace  @trace  out      out
------- ----------------------------------------- ------- ------- ----- -----



I have validated the data in accordance with the requirements of TP 710.

Technician ID#:_____    Date:_____

tol is +/-4 mph from times    .0 to  780.0 per EPCN 33
tol is +/-2 mph from times  780.0 to 1545.0 per CFR 600.109-78(b)(2)
```

Attachment M

FTP Video Drivers Aid Report

```
*******************************************************************************
* VIDEO DRIVER'S AID TEST REPORT (1.22b3)                   Page  1 of  4  *
*  0195^0000                               Processed: 08:11:34 01/30/95   *
*******************************************************************************

    -- Test and Vehicle Information --
Test Sch:  0195^0000                    Mfr:
Shift Sch: A474-0001                    Veh ID:
Drive Sch: FTP(Cert)                    Version:      00
Test Type: 01                          Eq Test Wgt:3875
Test Proc: 02                          Ind HP:       7.5
Driver ID: 42145                       Dyno Site:   d001
Key Start: 07:22:33 11/33/94

    -- Test Control Events --
          clock              event
 trace    time      test     time    CVS
 time     stamp    control  seconds  status
------  --------  --------  -------  --------
   .0              SETUP
   .0  07:21:48  CVSWAIT1     2.9 EOT
   .0  07:21:51  READY       42.1 RDY
   .0  07:22:33  STARTUP      2.6 BAG 1
   .0  07:22:36  DRIVE      505.0 BAG 1
 505.0  07:31:01  DRIVE      864.0 BAG 2
1369.0  07:45:25  SHUTDOWN     1.8 BAG 2
1369.0  07:45:27  DELAY        5.0 BAG 2
1369.0  07:45:32  HOT SOAK   540.0 SOAK
1369.0  07:54:32  CVSWAIT2     2.7 SOAK
1369.0  07:54:35  READY       34.4 SOAK
1369.0  07:55:09  STARTUP      2.7 BAG 3
1369.0  07:55:12  DRIVE      505.0 BAG 3
1874.0  08:03:37  FINISHED      .1 EOT

                                        -- Out of Tolerance Data --
    -- Comments --                      last    back           max
 trace                                  in tol  in tol secs    mph
 time     comments                      @trace  @trace  out    out
------  ------------------------------  ------  ------  -----  -----
 121.2 brakes                           121.1   126.4   5.3    2.0
 396.7 brakes                           396.6   396.8    .2     .0
 396.9 brakes                           396.8   397.1    .3     .0
1794.7 brakes                          1794.6  1794.8    .2     .0
1853.9 over accel                      1853.8  1854.1    .3     .1


 I started and drove this vehicle in accordance with the requirements of TP 707.

 Technician ID#:_____       Date:_____

 I have validated the data in accordance with the requirements of TP 707.

 Technician ID#:_____       Date:_____

 test tolerance is +/- 2 mph per CFR 86.115-78(b)(1)(i,ii)
```

Attachment N

Preliminary Laboratory Report

Test Information:

Run Number:	8	Vehicle Make:	Pontiac Grand Prix
Test Date:	6-Nov-98	Engine Number:	wh123456
Test Time:	14:28:35	Road Load Power:	7.5 hp
Test Type	EPA75	Inertia:	2500 lbm
Requester:	EPA	Shift Point Ph1,2	
Operator:	Ben Haynes	Shift Point Ph3	
Driver:	Ben Haynes	Transmission:	manual
Fuel Type:	Indolene	Odometer	197.9 mi
Fuel System:	MP9.0	Driver Errors:	0
Remarks:	dummy test		
Remarks:	remark2		

Test Conditions	Phase 1	Phase 2	Phase 3
Test Time (sec):	506.8	867.4	509.4
Avg. Cell Temp.(degF)	75	75.8	75.1
Avg. CVS Flow Rate (SCFM)	332.5	330.8	331.4
CVS Volume (SCF, 20degC)	2808.7	4757.6	2813.9
Dilution factor:	12.682	19.467	12.956
Bag Analysis Time (sec):	391	401	400
Driver Out of Limits (sec):	20.8	-16.4	0
Distance (mi)	3.568	3.874	3.583
Crank Time (sec):	2		4.6
Hold Time (sec):	0	0	0
Barometer (inHg)	29.1	29.1	29.2
Dew Point (degF)	47	47	46.8
Rel. Humidity(%):	37.1	36.1	36.5
Specific Humidity (grain/lbm)	48.914	48.962	48.464
Hum Corr Factor:	0.8909	0.8911	0.8892

Bag Results	THC	CO	NOx	CO2	CH4
Phase 1	(ppm)	(ppm)	(ppm)	(%)	(ppm)
Sample:	71.341	257.236	72.099	1.024	5.016
Ambient:	7.459	0.192	0.314	0.044	1.686
Net Concentration:	64.47	257.059	71.809	0.983	3.464
Phase 2					3.341
Sample:	37.8	106.753	21.719	0.674	1.68
Ambient:	9.045	-0.144	0.17	0.043	1.747
Net Concentration:	29.22	106.889	21.558	0.633	1.747
Phase 3					4.84
Sample:	60.381	203.096	64.233	1.008	1.697
Ambient:	8.043	-0.069	0.187	0.04	3.274
Net Concentration:	52.958	203.16	64.061	0.971	3.274

Mass Results (gm/ mi)	THC	CO	NOx	CO2	CH4
Phase 1	0.829	6.67	2.728	401.188	0.051
Phase 2	0.586	4.326	1.278	403.019	0.041
Phase 3	0.679	5.26	2.424	395.095	0.049
Weighted (Phase1,2,3)	0.66	5.07	1.89	400.47	0.04

Fuel Economy (mi/gal)	
Phase 1	21.4
Phase 2	21.53
Phase 3	21.86
Weighted (Phase1,2,3)	21.59